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### *Archæological News from Rome.*

ARCHÆOLOGISTS who visit Rome for business or for pleasure know most surely, and if they be Englishmen, most sadly, that if they want the latest and most reliable archæological news they must mount the Capitoline Hill and seek it at the Prussian Imperial Archæological Institute. Archæologists who stay at home wait year by year with impatience for the Report issued by that Institute. This Report for the past year, 1883, now lies before us. It appears as usual in triple form,—a "Bullettino," containing the business of the Institute, and a detailed account of the excavations undertaken,—in this instance at Palestrina, Vulci, Pompeii, Corneto, and Orvieto. The importance of this "Bulletino," dry though it may appear to the uninitiated, can scarcely be over-estimated; in it are recorded with the most minute precision month by month the *circumstances* of discoveries, just those details of place, surroundings, condition, and juxtaposition, for want of which so many of the objects in our old-established museum lose full half their scientific value. Next we have the "Annali" of the Institute, an illustrated issue devoted to the discussion of selected objects. It contains the best archæological opinion in Europe on the facts registered in the "Bullettino." These two issues are made complete each year by the appearance of the "Monumenti," a magnificent folio atlas, containing, in engraving, in phototype, in chromo-lithographs of remarkable accuracy and beauty, reproductions of the most important monuments discovered.

The field covered by this splendid publication is very wide. It embraces topography, architecture, sculpture, bronzes, terra-cottas, vase paintings. The Monumenti of 1883 contain plans and sections of the Rostra of Augustus, recently brought to light in the Forum, two painted sarcophagi from Clazomenæ, terra-cottas from Tarentum, two sarcophagi from Tarquinii, adorned with reliefs representing contests of Amazons and Centaurs with Greeks; a number of curious Sardinian antiquities of Egyptian style; fragments of inscriptions from Capena; a vase from Orvieto, with a curious representation of Heracles and Silenus; and lastly, the beautiful statue of Bacchus recently discovered in Hadrian's villa.

To some of these subjects we hope to return, but for the present it is this statue of Bacchus which claims our attention. The statue was found in a hollow place beneath a staircase in the part of the villa commonly known as the library. It is singularly well preserved, only the right hand missing. Its great beauty and merit were recognised at once, and casts were promptly made, of which one is at Berlin, a second at Strasbourg, and, as we had occasion to notice some months ago, a third in the new cast museum at Cambridge.* We spoke then of the diversity of opinion among archæologists as to the style and date of the statue. No one had as yet spoken with authority; indeed, such opinion as was expressed was expressed with the utmost timidity; all felt they had to face a difficult problem. In the present number of the "Annali" Professor Michaelis devotes a long and very interesting article to the analysis of the statue, and if he has not spoken the last word on the subject he has, at least, said all that can be said in the present state of our information. The statue itself is reproduced in two heliographic plates, giving four views, two front and two back. It represents a youth standing with the weight of the body thrown on the right leg, the left hanging behind in the Polycleitean attitude. The right hand is raised, and held, no doubt, some attribute; the left hangs down. Over the right shoulder is thrown a nebris, tied by the two paws of the fawn, and falls, back and front, with studied symmetry. This nebris, of course, marks the figure as belonging to the Bacchic cycle. The ideal beauty of the head, the total absence of any beast-element, pointed ears, snub nose, shaggy hair, prevent the supposition that the youth is a satyr. There remains no doubt that he is the god Bacchus himself, represented in his later aspect as a beautiful, effeminate youth. A number of problems arise, which Professor Michaelis raises and solves one by one. What did the god hold in his right hand, now broken? Probably, judging from certain marks remaining on the marble,—a two-handled wine-cup or kantharos, a frequent attribute of Bacchus. From the direction of arm and eyes, it is further probable that he was in the act of pouring out the wine. This supposition is further borne out by the fact that a statue of Bacchus in this very attitude was executed by the ancient sculptor Calamis, and its general pose and motive are preserved for us on a coin of Tanagra. Next arises the question, Have we before us an original or a copy? If a copy, was the original of marble or bronze? The practised eye can detect by certain peculiarities of technique a copy from a bronze; and Prof. Michaelis thinks we have here such a copy. He calls attention to the stump of a tree introduced to support the figure, and greatly spoiling the beauty of line of the lower limbs. Some such support frequently is added to marble copies of bronze originals, the more tenacious bronze needing no such aid. Similar meretricious supports are given to the long pendent folds of the nebris. Had the original been of marble, it would have been quite easy to avoid any such necessity. Further, in the chiselling of the nebris there is a sharpness peculiar to bronze technique.

Last and most important comes the question to what date and school the work is to be assigned. At first sight, as Prof. Michaelis owns, the statue strikes one as an echo of the manner of Polycleitus. The position on one leg, the delicate balance of half the body at rest and half in motion, the right hand lifted and the left leg drooping, the so-called chiasmus scheme, the slightly-inclined head, all recall Polycleitus. But, rigidly examined, the proportions of the limbs do not correspond to the Polycleitean canon, as we know it in the Doryphoros,—the legs especially are too slender and graceful, the foot too short. Still less,—excepting for the softness and grace inseparable from the conception of the youthful Bacchus,—has it the true Praxitelean ease and flow and charm. Place the statue by the side of the Praxitelean Hermes, and we feel the difference at once. We cannot follow Prof. Michaelis through the details of his argument; it must suffice us to state his conclusion. He believes the statue to be a work of the eclectic school, the post-Alexandrian manner which selected and combined and advisedly imitated the style of bygone manners, which sought to revive the manner of the best Attic and Argive work. This eclectic tendency is discernible by a sense of unreality, of effort, of restraint; its archaisms are conscious instead of naïve. It is also marked by a want of harmony which creates uneasiness in the spectator, — an uneasiness felt by every trained eye in looking at this statue of Bacchus. This want of harmony Professor Michaelis discerns in three respects:—first, the mingling of the masculine and feminine elements necessary in an effeminate type, is inharmonious,—opposite characteristics are harshly juxtaposed rather than naturally blended; second, in the actual anatomy there is a good deal that is incom-

* The statue is seen in our No. III. view of the Sculpture Museum at Cambridge (*Builder*, May 24 of this year), a figure on the right in the background, next to the sculptured drum of the column from Ephesus.

patible,—*e.g.*, the strength and size of the thorax is incompatible with the slender legs; third, as regards the face, the severity and fixedness of the expression, and the artificial archaism of the hand, are out of harmony with general modernness of the figure and the *morbidezza* of the skin. The elaborate treatment of the hair deserves further notice,—it has no parallel in male statues, only one in female,—that is in the hair of Elektra of the well-known group of the so-called Orestes and Elektra of the Naples Museum. That group, on grounds which are beyond dispute, is attributed to the eclectic school of Pasiteles. Prof. Michaelis does not go so far as to attribute the new Bacchus to the school of Pasiteles; but the analogy of the hair is a definite point for a very interesting comparison. The cast of the Bacchus in the museum at Berlin stands near the group of Praxitelean statues. It would be instructive to see it placed in Pasitelean surroundings. Though the verdict of archæologists in general will in all probability agree with that of Prof. Michaelis, in stamping the Bacchus as eclectic, its extraordinary beauty will not be denied; indeed, the slight touch of delicate consciousness under severe restraint will to some eyes only enhance its charm.

## THE METROPOLITAN BOARD OF WORKS AND LONDON THEATRES.*

THE Board has now dealt with the whole of the London theatres, with the exception of the theatre at the Crystal Palace, as well as most of the principal music-halls. In some instances the theatre has been closed by the action of the Board, in others it has been rebuilt, in others alterations have been effected at a cost varying from a comparatively insignificant to a very large sum, and in no single instance has it been found that some alteration was not required. In the case of one theatre, the Strand, a sum of nearly 15,000*l.* was expended in remodelling the interior, and providing additional exits, including the purchase of adjoining property for the purpose of providing the necessary accommodation. A portion of this sum will probably be recouped by re-sale of the ground, but the money had to be expended in order to rebuild the theatre, and the recoupment is more a matter of calculation than of certainty.

The theatres which were considered by the Board to be unfitted for the reception of the public were the Prince of Wales's Theatre, the Royalty Theatre, Hengler's Cirque, Clapton Park Theatre, and the Criterion, and an intimation was sent by the Board to that effect to the Lord Chamberlain, who thereupon declined to renew the licences in respect of these places. With regard to the Criterion Theatre, very strong representations were made to the Board, and the owners, having expended a very large sum in carrying out certain alterations to the building, the Board advised the Lord Chamberlain that, in their opinion, the licence of this theatre might be renewed, and the licence was renewed accordingly. The cost of the alterations to this theatre, in order to meet the views of the Board, was about 10,000*l.*, exclusive of the installation of the electric light, which cost about 2,500*l.* in addition.

The Royalty Theatre, which was originally built for performances by Miss Kelly's pupils, on the site of a garden in the rear of her house in Dean-street, Soho, was rebuilt in 1882-3, from designs by Mr. Thomas Verity, and was reopened in the spring of 1883. The Prince of Wales's Theatre and Hengler's Cirque are closed, and the Clapton Park Theatre is only opened occasionally, being chiefly used for amateur performances.

One of the earliest theatres dealt with by the Board under the powers conferred by the 11th section of the Metropolis Management and Building Act Amendment Act, 1878, was the Lyceum Theatre. This theatre was built for Mr. Arnold, in 1834, from the designs of Mr. Chas. Beazeley, an eminent architect and prolific dramatic author. The theatre occupies an extensive site, with a considerable frontage upon Wellington-street, Strand, and extends back to Burleigh-street. The pit entrance is in the Strand, and the gallery entrance and the stage entrance are in Exeter-street, on the north side of the theatre. The premises have been enlarged from time to time since they were first built, and recently received considerable additions by the absorption of the rooms formerly occupied by the Beef Steak Club, which now form part of the premises of the theatre. The gallery staircase was narrow and inconvenient, and it was a standing joke that the architect forgot the staircase, and that it was added after the completion of the building. This is inconceivable, and there being a similar story told of several other buildings, it may be safely relegated to the realm of legendary lore, together with the story of the body of the boy who was murdered by the Jews, which floated up against the stream to Bacarach,* of which story there are numerous variants. The explanation of the narrowness of the old gallery staircase is that the owner of the theatre intended to purchase additional property in order to construct the staircase, but that being disappointed in his intention, he was reduced to construct it in the inconvenient form in which it remained from the completion of the theatre until the year 1882.

The Board served a notice upon the owner of the theatre requiring the gallery staircase to be reconstructed; the proscenium wall to be carried up to a height of at least 3 ft. above the roof, and be carried down through the cellar in order to effectually divide the stage from the audience portion of the theatre; that the carpenter's shop in the roof, which extends over the auditorium, should be separated from the auditorium by a fire-resisting floor; that additional means of exit should be provided from the pit and the dressing-rooms on the north side of the theatre premises.

The only means of egress from the pit of this theatre was by a passage-way, a portion of which runs under the first floor of a public house fronting upon the Strand. The pit will accommodate about 800 persons, and, in the event of a fire occurring in any of the houses abutting upon the passage-way out of the Strand, the only means of escape for the audience would have been by climbing over the barrier between the pit and stalls, and making their way into Wellington-street by the stalls corridor, or by passing over the stage. The importance of providing sufficient means of exit for the persons employed behind the scenes may be estimated from the fact that during Mr. Irving's management as many as 600 persons have been engaged upon the stage, or in connexion therewith. During the run of "Romeo and Juliet" it was stated that, excluding the acting company and the persons employed in the front of the house and the dressing-rooms, there were forty musicians, sixty carpenters, sixty men employed in the working of the gas and lime light, 250 extras and supers., and forty artists and artisans employed in the painting-rooms and property-shops.

The cost of the alterations suggested by the Board was estimated at about 1,200*l.*, exclusive of the cost of reinstating fittings and decoration.

The owner of the theatre appealed against the notice served by the Board, and the First Commissioner of her Majesty's Works and Buildings having appointed Sir Henry Hunt, C.B., to act as abitrator, the appeal was heard at the Surveyors' Institution, Westminster, in July, 1882; Mr. Meadows White, Q.C., and Mr. F. G. M. Freeman, representing the Metropolitan Board of Works; and Mr. Merewether appearing for the owner of the theatre. The arbitrator, after hearing the evidence adduced upon both sides, and making two inspections of the theatre, made an award confirming in effect the requisitions made by the Board, certain modifications being allowed in the manner of execution of the works, chiefly with a view to the convenience of the owners. The works ordered by the arbitrator's award were carried out within the time specified, without occasioning interruption to the performance.

The award of the arbitrator in this case settled the question of the proscenium wall, as to which there was some uncertainty, and this precaution was insisted upon by the Board in the case of other theatres dealt with under the Act. The owners of Drury Lane Theatre appealed against the Board's notice, mainly on account of the requirement with regard to the proscenium wall, but this requirement was confirmed on appeal.

It is a singular fact that in no single instance was an old theatre found to be provided with a proper proscenium wall to divide the audience from the stage. In some cases,—as, for example, at Covent Garden, Drury Lane, and the St. James's,—there was no wall, but merely a partition of wood, to which slabs of concrete had been added by the recommendation of the Lord Chamberlain; in others, the wall was carried up to the underside of the roof, but not through the roof, as at the Gaiety; in others, as in the case of the Lyceum, the Adelphi, &c., the wall had been carried up to the top of the proscenium opening, but had not been continued down under the stage so as to effectually separate the audience portion from the working part of the theatre. Covent Garden Theatre was rebuilt as late as 1858, under the superintendence of the late Mr. Edward Barry, at a cost of about 70,000*l.*, and it is surprising to find that the necessity for this separation was not recognised at that date. It is now agreed, by those most capable of forming an opinion on the subject, that by the erection of a proscenium wall carried up above the roof, and carried down to the foundations of the theatre, the risk to the public, in the case of an outbreak of fire in a theatre, is greatly diminished. This was insisted upon by Mr. Phipps, in his evidence before the Fire Brigade Committee in 1877, and the construction of a proper proscenium wall forms part of the regulations as regards construction imposed by the municipal authorities of all the capitals and large cities of the Continent.*

It may here be remarked that it is a mistake to suppose that Continental cities are in a better position than London as regards the regulation and supervision of theatres and places of public amusement. In Paris, the supervision of theatres was until recently governed by rules framed in the year 1828, slightly enlarged in 1864 and 1868, and it was not until May, 1881, that the present regulations were promulgated. The Berlin regulations with regard to theatres at present in force are dated June 29th, 1881. The Vienna regulations were made in the same year. The Hamburg Theatre Regulations are dated 1877; the Russian Regulations are dated as late as March, 1883, but it is not known if they have been made obligatory. In all countries, even the most despotic, the difficulty has been experienced of reconciling the alterations necessary for securing the safety of the public, with a proper regard for the vested interests of the proprietors of places of public

* See p. 248, *ante*.

* "And that's the town of Oberwesel, where the boy was murder'd by the Jews,
Whose body floated up the stream to Bacarach, tho' some refuse
To credit the tradition, as a different edition
Is extant in nearly all the towns you pass upon the Rhine." ALBERT SMITH.

* In a note to a paper read by Mr. E. M. Barry before the Royal Institute of British Architects, February 6th, 1860, on the "Construction and Rebuilding of the Royal Italian Opera-house, Covent-garden," the author, referring to the destruction of the old house in March, 1856, remarks that it had been stated that the entire removal of a cross division wall, and arch over the proscenium at some period, probably long subsequent to the original construction of the building, allowed the fire to spread through the roof of Sir Robert Smirke's Covent Garden Theatre; certainly he adds, "had such a fireproof division across and above the roof remained, a check might have been given to the flames, so that the firemen on duty at the house might possibly have subdued them at the first outbreak." It was sought to guard against the possibility of fire being communicated to the auditory from the roof by constructing the roof and its external covering of incombustible materials, but it never seems to have occurred to Mr. Barry to revert to Smirke's expedient and separate the roofs by a brick wall,—the only effectual mode of separation. It has been a ground of complaint that since the erection of the proscenium wall draughts are occasioned in the auditorium when the curtain is raised, in consequence of the cold air accumulating in the upper part of the stage, and not finding any outlet into the space over the ceiling of the auditorium, the cold air falls through the warm air in the body of the house, and causes inconvenience to the audience. The remedy for this defect would be to properly warm the stage to the same temperature as the auditory, and to provide proper outlets in the roof of the stage, protected by cowls.

amusement, and this problem appears to have been found very little less difficult of solution in St. Petersburg than in Paris and London. It will be observed that the St. Petersburg regulations with regard to site are not retrospective, and only apply to new theatres.

The latest regulations with regard to theatres are those drawn up by a Commission appointed by the St. Petersburg Municipal Council. This Commission, which consisted of two engineers, one architect, and the chief of the St. Petersburg Fire Brigade, was appointed in 1881, shortly after the catastrophe at the Ring Theatre at Vienna, and their report is dated March, 1883. All new theatres must be isolated, and must have windows and doors upon all the four sides; the walls, ceilings, and roofs must be of incombustible materials; the staircases and landings must be spacious, nowhere less than a stride across, and single steps are not permitted; all doors must open outwards; dwelling-rooms are not allowed in any part of a theatre; not more than four tiers are allowed above the pit level; central passages,—not less than 4 ft. 8 in. wide, and side passages 3 ft. wide,—are to be provided in every part of a theatre; the widths of the corridors and vestibules are strictly regulated; cloak-rooms are to be provided near the entrance vestibules; pass staircases are not allowed; the proscenium is to be fitted with a fire-resisting curtain, and an opening, with a superficial area of at least 50 ft., provided in the roof of the stage; every theatre must have a lightning-conductor. The lighting and heating arrangements are minutely regulated. The scenery and the light dresses of performers are to be rendered uninflammable. Every theatre must be placed under the control of a responsible person, who shall have the requisite number of assistants, who must be present during every performance, as well as one hour before and one hour after the same. Every new theatre upon its completion must be certified by the executive Commission specially appointed by the Municipal Council for the control of theatres.

The greater part of these regulations are applicable to existing theatres, either at once or at the expiration of terms varying from six months to twelve months from their confirmation, with the exception of the regulation with regard to the site and the construction of the walls, ceilings, and roofs of incombustible materials, which are not obligatory on existing theatres.

It is an important distinction that the cost of any structural works required by the Board under the Act of 1877, giving the Board control over certain places of public entertainment, falls upon the owner and not upon the lessee or occupier. The term "owner" is defined by the 250th section of the 18th and 19th Victoria, c. 120 (The Metropolis Local Management Act, 1855), to mean the person for the time being receiving the rack rent of the premises in connexion with which the word is used, whether on his own account or as agent or trustee, or who would so receive the same if such premises were let at a rack rent.

As regards Covent Garden Theatre, the Board's requirements included the building of a proscenium wall; the covering of the floors in the roof of the theatre with fire-resisting materials; the construction of an additional staircase on the south side of the theatre; the closing of the doorways between the theatre and the Floral Hall adjoining with iron doors; fixing handrails on both sides of all staircases, and making all doors to open outwards. The Board's notice in this case was not appealed against, and the works were carried out during the recess at a cost of about 4,500*l*. This sum is, perhaps, the largest sum that has been expended upon a theatre on structural alterations alone at the instance of the Metropolitan Board.

The alterations considered necessary by the Board in respect of Drury Lane Theatre comprised the building of a proscenium wall; the complete separation of the carpenter's shop over the stage from the space under the roof over the auditorium; the provision of handrails on both sides of certain of the staircases, and the strengthening of certain of the existing handrails; the alteration of certain doors, and the formation of an additional exit from the upper gallery. The notice was appealed against by the owners, the chief contention being with regard to the proscenium wall, and the arbitrator (Sir H. A. Hunt) confirmed the notice, with some unimportant modifications.

The proceedings with regard to these three theatres will give some idea of the course of action taken by the Board with regard to the other London theatres, the requirements of the Board being in other cases of a similar character, but varied, of course, by the circumstances of each case.

The total amount expended by the Board in the carrying-out of the Act of Parliament up to the present date is about 3,700*l*. This must be considered to be a moderate amount, looking to the number of buildings that have been surveyed and the extent of the alterations which have been effected under the Act. The estimated amount of the expenses of the Board for the current year is 1,000*l*. The official cost of the Act is thus about 100*l*. for each theatre, which will, probably, be viewed by the public as not being an excessive amount for securing their comfort and safety. Great apprehensions were expressed by several of the witnesses who were examined by the Fire Brigade Committee in 1877 as to the cost of a proper supervision of the Metropolitan Theatres, and it was generally agreed that it would be impossible to obtain an efficient control over all theatres without the creation of a new department, and that the cost of such an establishment would be very great. It has now been shown that the apprehensions expressed with regard to the cost to the country of the superintendence of theatres was unfounded, and that an existing municipal body has been able, by a slight increase in its staff and with a very small amount of inconvenience to the managers of theatres, to carry out some very important alterations, the value of which will be felt by the public in the event of the occurrence of a fire or panic. These alterations have been effected in an unobtrusive manner, the public having been, for the most part, unaware that any changes had been made, and attention not having been called to the subject no unnecessary alarm has been created.

It is to be hoped that the action of the Board will silence those alarmists who are continually declaiming against the dangerous condition of London theatres, and that Mr. Dixon-Hartland and those Members of Parliament who think with him, will be satisfied that all that is possible to be done under the existing law has been done. It may well be that some further legislation on the subject is necessary, and, in particular, that the dual jurisdiction of the Lord Chamberlain and the Metropolitan Board of Works should be abolished, and one central independent authority substituted; but, until public opinion pronounces distinctly in favour of this alteration, it is useless to expect any reform in this respect.

## LONDON WATER.*

THIS pamphlet, which is the latest contribution to the literature of the much-discussed subject of the London water supply, is an attempt "to compress within reasonable limits the chief facts,—historical, physical, and scientific,—bearing on the question at issue," with a view to facilitate the comprehension of the principal points involved therein by the parties most interested. Though there is but little new matter imported, yet the results of the various scientific investigations hitherto carried out have been succinctly collated, so that any intelligent consumer of London water may, if he is able to reconcile satisfactorily to himself the widely different conclusions which have been drawn from those investigations, arrive at some idea of the quality of the article for which he is called upon half-yearly, without option, to pay. In the Parliamentary history of the water companies with which the author introduces his subject, a summary is given of the items which made up the amount of thirty-three millions sterling with which it was proposed in 1880 to buy up their interests, but which failed, together with the subsequent attempt of the Metropolitan Board of Works to pass a Bill for enforcing the sale of water by meter. Doubtless the proposed purchase-money seemed at the time an exorbitant valuation of the water companies' property, and totally disproportioned to the capital cost of their works. If viewed only in the light of the existing and future profits derivable by the shareholders, it was, perhaps, a not inequitable valuation on the part of a Legislature whose loose ruling empowered the companies to increase the value of their property by arbitrarily raising their customers' rates without any obligation to afford a corresponding equivalent in the quantity or quality of the article they supplied. If that ruling is still to hold good for all time, then a fatal mistake was made when the original proposal was thrown over; but if it is in the power of the Legislature, and there is any intention to exercise that power, to relieve the population of London from a burden to which there is seemingly no limit, then no further time should be allowed to elapse before action takes the place of profitless discussion which promises to be interminable.

In the chapter on "The Theory of the Physiological Effects of Polluted Water," the author enters into the arguments of the two contending parties who respectively advocate and oppose the use of the Thames and Lea as sources of supply for the metropolis. These arguments have more than once been presented to the readers of the *Builder*, and only lately the lectures read at the Society of Arts Conference held at the Health Exhibition contained the most recent contributions to the subject, some of which, notably the important paper by Professor Sorby, are, however, not to be found in General Scott's pamphlet, which gives a fairly impartial summary of the results of experiments and investigations made by the most distinguished chemists of the day in the detection of chemical impurities, and how far they fail by chemical means at arriving at safe conclusions, although the author seems to have been unaware of, or to have overlooked, the help that can be secured in any modern laboratory fitted up for biological research. No chemist can detect the bacteria or bacilli, or other septic or disease germs with which the scientific world is so much occupying itself; whereas, with the aid of a test tube, containing sterilised gelatine solution, a proper needle to inoculate it with any germ that water may contain, the presence of such microscopic organisms is at once revealed, even without the aid of a microscope. It is evident, then, that the discoveries made by the biologists are destined to play a most important part in the solution of the vexed question of water purity, for while the chemist is only able to pronounce on the presence of purely chemical matter, the biological investigator detects the living organism, though at present it is doubtful how far its connexion with any specific disease has been accurately defined.

Too little importance seems to be ascribed to the process of oxygenation, or, more popularly, of aëration. It is a well-ascertained fact that a tumbler of water impregnated with disease germs will, after a certain moderate degree of exposure to air and light, become innocuous; and, therefore, before pronouncing definitely on the unfitness of the Thames as a source of supply, surely it is not beyond the resources of engineering science to devise some means by which a sufficiency of aëration may be given to river water so as to render it perfectly wholesome. The statement so often brought forward as to the impurity of the Thames above the intakes of the water companies, and repeated in General Scott's pamphlet, was stoutly denied by one of the Thames Conservators at the late Conference. We can ourselves, from recent personal expe-

* "A Review of the Present Condition and Suggested Improvements of the Metropolitan Water Supply." By A. De C. Scott, Major-General Royal Engineers. London: Chapman & Hall. 1884.

rience, testify to the absolute clearness of the water at Chertsey; and if, in a year of extreme drought like the present, when the volume of the Thames is less than it has been for many years, the water for potable purposes is so good, it can scarcely be questioned that in average years, when the volume is considerably greater, its quality cannot be inferior. Doubts are expressed, based on experiments made on the Irwell, Mersey, and Darwen, as to the degree of purification exercised in sewage-contaminated water, after running a course of eleven to thirteen miles; but, as pointed out by General Scott, various sources of error must always operate in such experiments. Water flowing with a sluggish current over a smooth river bed will not receive the amount of aëration which a mountain stream bubbling over a pebbly or rocky bed does; but place a weir across the same river, and let the same water be passed in a moderately thin film over its crest and be broken up afterwards on the rubble apron below, and the amount of aëration it will have received will at once be seen; so, mere distance of flow does not afford a sufficient criterion to determine the question at issue. If, therefore, the water companies would introduce some artificial expedient for aërating the water pumped from the river before discharging it either into their subsiding reservoirs or their mains, the quality of their water would be still further improved. The great practical test, however, remains, as we lately observed, in the fact that as long as the death-rate of a great city like London remains as low as it is at present, there cannot be much the matter with its water supply, especially when there are so many other causes operating for the spread of disease; and so long as this holds good, it seems inexpedient to search for our supply from more distant sources.

While, however, we cannot hold with the conclusion at which General Scott has arrived as to the necessity or even advisability of drawing a supply for the metropolis from the mountain districts or from the lakes, we have no hesitation in pronouncing on its engineering feasibility. Any works of the kind that may have to be undertaken are as nothing in comparison with the scale on which the grand water projects of India and America, not to mention those of neighbouring Continental States, have been carried out. There is one consideration, however, with reference to the Thames supply which is not noticed in the pamphlet, viz., that if,—as in all probability it will be,—a further volume has to be taken from it for the supply not only of the metropolis, but of the principal towns in the river basin, the Conservators should insist on the supply being first stored in the upper feeders, otherwise the lower reaches of the river will be most injuriously affected, especially in regard to navigation. The sites of such storage works would afford the best opportunity possible for effecting the requisite degree of aëration, and so supply, were it necessary, an additional argument for the construction of such works. Unquestionably, it would, if possible, be better to avoid altogether, the discharge of sewage, pumped or otherwise, into the Thames, especially in its lower reaches; and, therefore, if possible within any practical limit as to cost, the sewage of the Thames Valley would be best disposed of by conveyance direct to the sea, as that of the metropolis itself must inevitably be eventually carried thither.

Most persons will heartily endorse the remarks that General Scott makes as to the necessity for the constitution of a representative authority for the whole metropolis, including its suburbs, having plenary power to deal with the question of water supply, and as to the inadvisability of postponing the settlement of this question until the passing of the London Government Bill, which has already been shelved to the Greek kalends. We would, however, be disposed to go still further and to again insist on the necessity for the constitution of a central water authority, not for the metropolis only, but for the regulation of the waters of the entire United Kingdom.

## NOTES.

LORD RAYLEIGH'S address at the opening of the British Association at Montreal on the 27th was one of the specialist, not one of the comprehensive or all-round types of presidential address which have usually been most favoured, and which perhaps best answer the real end of a general inaugural address on such an occasion. But to survey even the outlines of all science so as to give a comprehensive sketch of the position attained and the progress made since the preceding year of meeting, is given to few indeed, and is likely to be the gift of fewer still as each department of scientific study increases in significance and complexity. Lord Rayleigh only did, therefore, what most future presidents will probably be obliged to do, in confining himself to the subjects (mathematics and physics) which he has made his special study; and he succeeded in bringing out the practical relation of recent discoveries to actual and every-day life in a manner calculated to interest even the more unscientific among his hearers, though some parts of the address can have been hardly "understanded of the people." We shall probably have more special remarks to make in regard to the bearing of some of the sectional papers and discussions on our own subjects, when letters can have crossed the Atlantic, and we shall be no longer dependent on telegraphic summaries, which will probably be all that our hard-worked "dailies" will be able to give us of the majority of the papers read in the various sections.

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FROM the German School at Athens comes the following *resumé* of the excavating work of the year. In the Piræus the foundations of a large building of Hellenistic date have been laid bare. Inscriptions found on the spot make it probable that the excavators have lighted on the local shrine of a Thiasos of Dionysiasts. Full details are to be given by M. Dragatsis in the next issue of the modern Greek publication, the *Archæological Ephemeris*. It seems a pity that important discoveries should be discussed in this but-little-known tongue. In the same periodical will appear a dissertation on the last excavations made at Olympia by H. Dimitriadis since the site was handed over to the Greeks. Some new fragments of the pediment groups have been discovered. The Athenian Archæological Society has been conducting excavations at Epidaurus under the supervision of M. Kabbadias. This rising Greek archæologist was trained in Germany; let us hope his report will appear in German, the common tongue of archæologists. The French School has recommenced its work at Elateia, where a shrine of Athene Kranaia is being laid bare. Dr. Schliemann's excavations at Tirynth have come to an end. The results will appear in a special volume.

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THE *Irish Builder* hopes that the construction of the new museum will be made an opportunity for utilising native stone and other materials. Portland stone has answered well in the Dublin atmosphere, it is true, but "in the ruins of Moyne Abbey there is native oolite which has stood the test of several centuries, and there is still a remarkable sharpness in the carving and cutting." And in the matter of granite and marbles there is, as we all know, a great variety of tone, surface, and colour obtainable. Our contemporary observes that the facing of Leinster House, to which the new building will be contiguous, is native granite, procured at Dalkey or at Wicklow, and obviously means to suggest the employment of this material in the new building. The question of the use of granite for an enduring building is thus being mooted in Dublin, as it has been mooted in London (for more directly practical reasons) in regard to the New War Offices. It must not be forgotten, however, that granite requires a special architectural treatment, in regard to which no systematic attempt seems to have been made, unless it be in some of the street architecture of Aberdeen; and a building designed for freestone would have to be entirely remodelled in style and detail for granite. But the idea expressed by our contemporary should not be lost sight of. The great wish of many patriotic Irishmen for the employment of native art and native materials has been sometimes shown in a manner at variance with true artistic and political economy,—*e.g.*, in the various attempts to create an artificial market for Irish lace; but the use of the building stone of the country for the buildings erected on its soil is, in general, both commercially and architecturally advantageous. There is a certain harmony between a building stone and the aspect of the country in which it has grown; and the employment of local materials conduces also to character in architecture.

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THE lack of water, or the fear that this element will become very scarce, has found in this hot summer a prominent place in the mind of dwellers of the country. It is, therefore, a fitting time to point out how shamefully the supply of water is wasted in the country. We by no means wish to assert that throughout many weeks of dry weather, even the most bountiful store of rain-water may not run short. But one thing is quite certain, that many dwelling-houses and farms have absolutely no store of rain-water except such as is to be found in some small cisterns and old-fashioned wooden barrels. Every dwelling-house and farm should, on the contrary, be supplied with a large slate cistern (we do not, however, insist on the special material) capable of holding many gallons of water, and it should be placed below the surface, and all roof water should flow into it. When such water stores exist they enable farmers and householders to have, at any rate, a long-continuing supply, and where there is a considerable expanse of roof even a single thunderstorm will produce much water. It is unnecessary to dilate on the saving of labour and the enormous advantages of these underground stores; but it is remarkable that innumerable houses and farms throughout England are without them. We unhesitatingly say that they should be found at every residence and homestead in the country.

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IN regard to the subject of ballooning, and the recent French experiment in steering a balloon, it may be noted that the analogies of nature are adverse to the attainment of artificial flight by means of a balloon. We do not mean by way of detail, but by way of principle. The theory of a balloon is that of levitation, that is to say, of counterpoising gravity by the displacing a given bulk of atmospheric air by a lighter gas. That the latter method involves the exposure of so large a surface to atmospheric currents as to require great force to overcome the resistance of a rapid breeze by fans, screws, or other mechanical means, is well known. But the point to which we refer is this. In the flight of every bird or insect the weight of the animal is directly utilised for maintaining it in the air. At the will of the bird the feathered surface that it exposes to the wind can be so inclined to the movement of the latter as to make the creature rise or fall at will, by the direct action of the wind, without any visible motion of the wings. From the deck of a vessel a gull may be watched, hovering, for many minutes together, without one flap of its wings. The bird, at such times, is a living kite, its power of self-balance producing the effect of the string of the kite in maintaining a certain inclined position relative to the wind. And although some birds of the swiftest flight have an extraordinary area of wing surface in proportion to their weight, others, of equal or even superior power of flight, have very little wing surface in proportion to their weight. Thus the problem of flight has been solved by nature in many ways; but in all of them the gravity of the living creature, far from being destroyed or counterpoised, is an essential element of its mechanical action. The inference that we draw from this is that the opposite principle, that of levitation, is not likely to be followed with mechanical success, except on rare occasions.

THE Executive Committee of the Annual Liverpool Picture Exhibition have taken a step this year which is equally spirited and admirable. The opening of the exhibition, of which the private view takes place to-day (Saturday), inaugurates the new rooms gained by the extension of the "Walker Art Gallery," and the committee have started the idea of having representative exhibitions of the works of the leading art societies of the kingdom, each in a room allotted to it. The exhibitions which will thus be represented over again in Liverpool by a selection from the works of the year in the Grosvenor Gallery, the Royal Society of Painters in Water-Colours, the Royal Institute of Painters in Water-Colours, the Royal Hibernian Academy, the Institute of Painters in Oil Colours, the Dudley Gallery Art Society, and the Society of Painter-Etchers, and the Liverpool Academy of Fine Arts. All this is in addition to the general exhibition (which we presume will include a fair proportion of the Royal Academy works of the year); and there is a special room besides for architectural designs. Each room has been under the arrangement of two or three members of the Society concerned, and the architectural room is under the charge of three Liverpool architects, Messrs. E. Kirby, Charles Aldridge, and A. Culshaw. As far as we are aware, nothing so comprehensive has ever been attempted at an annual provincial exhibition; and the experiment deserves special note, not only on account of its immediate interest, but also as one out of other signs of the growing tendency to break through the barriers of centralisation, and to establish new centres in the provinces. This is a kind of movement which we expect to see progress. Birmingham has become a political centre; Manchester has been for some time a musical centre, giving concerts equal to any in London, chiefly owing to the talent and energy of one man; and now Liverpool seems bent on becoming an art centre, and has certainly made an important step in that direction by the comprehensive scheme for this year's Exhibition.

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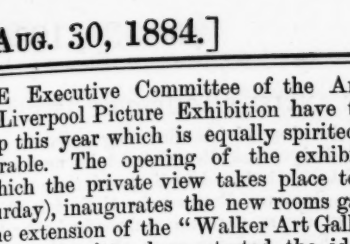
WE have had sent to us by Mr. Stanley, the well-known optician, the ingenious and theoretically correct instrument figured here, for dividing a line or a space into




equal parts without measuring off. Supposing the space between the lines *e* and *d* is to be divided into thirteen parts, the lower limb, B, of the folding rule is adjusted to the lower line, and the upper limb opened till the division marked 13 cuts the upper line: the sliding portion, C, is then moved along till the mark on it coincides with the "13" mark, and by means of small pin-points on the lower side C is fixed in its position. A is then slid along it so that each division on it coincides successively with the cross-mark on C, and at each such position the limb B presents its edge in the correct place to draw the dividing line. The instrument is the invention of a lady, Miss Marks, an ex-student of Girton College. In a non-professional paper in which it was mentioned we observed that it was thought necessary to make a sort of "point" of the fact that a lady was the inventor. We know better than to pay Girton so poor a compliment; but, at the same time, we may point out that in saying the instrument is "theoretically" correct we mean to imply a certain question as to its practical value. It is a scientific way of getting what is wanted, and dividing out with a pair of hair-dividers is a rule-of-thumb way; but, practically, Miss Marks's instrument requires a certain care in the using to ensure accuracy. It has a liability to practical error which increases with the decrease of the angle at which it is used; and we venture to think that a practised draughtsman would divide out scales and other similar measurements with a pair of dividers as correctly (more correctly in small distances) and twice as rapidly as he would do it with the "line-divider" to adjust.

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"CASSELL'S Technical Educator" is, as all the world knows, and as is indeed stated on its title-page, the technical series of "Cassell's Popular Educator," and contains a great deal of useful information, sometimes scientific, sometimes more or less empirical. But what demon whispered to the director of the publication to go out of his proper "technical" line in Part VII., and to "have a taste" in decoration? The excuse seems to have been the presence in the same number of some articles on colour by that eminent authority, Professor Church. But it is one thing to theorise correctly about colour, another thing to give examples of coloured decoration, which is done in a fearful and wonderful chromo-lithograph frontispiece, illustrating three specimens of "cornice, ceiling, and wall colouring." The colours of dado and wall, as mere colours, are far too strong for surfaces unbroken by ornament,—they would be simply violent in themselves, and irrespective of design; and as to the design, and the details of colouring of the cornice and ceiling, they are too ludicrously dreadful to speak of. *Ne sutor ultra crepidam*; which, freely translated, means, "The Technical Educator had better not meddle with art."

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MAJOR MARINDIN has reported to the Board of Trade on the Penistone accident, to the effect that it was due to the breaking of the web of the crank-axle, and that in his opinion the accident was one that could not have been foreseen or provided against. In the letter of this judgment we believe all competent persons will concur; but as since that accident we have had more than one breakage of a crank-axle while running, it certainly seems time that the question should be positively asked whether crank-axles and inside cylinders are desirable for fast-running engines, and whether the recorded facts of the breakage of crank-axles do not justify legislative regulation in this matter. Major Marindin also states that the lamentable consequences of the accident might have been mitigated by a quickly-acting and powerful continuous break; but this we think more open to question.

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THE Rector of St. John's, Clerkenwell, calls attention to the desirability of saving the disused burial-ground attached to St. John's Church, Clerkenwell, as an oäsis in that crowded part of London, where trees and shrubs may be planted and kept up for the pleasure of those living in a very poor neighbourhood, and a place of repose and refreshment to the eye and mind thus provided. He has offered the ground to the Holborn Board of Works, but they "do not want it"; he has sought help from the Metropolitan Boulevard Society (who, from their title, should be the right body to apply to), but has only received "good advice." 500*l.* would do what is wanted. Such a sum for such a truly philanthropic purpose ought to be forthcoming.

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IT may interest some of our readers who believe in Art for the People, to hear that the fine sculptural group of "Isaac and Esau," by Mr. E. R. Mullins, which formed the last of our illustrations of the sculpture in this year's Academy, has since the close of the Academy been on loan at an East-end church (St. Jude's, Whitechapel), where it stands at the east end of one of the aisles, and has not only attracted considerable interest on the part of the congregation, but became also the "text" for a sermon.

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A BRIDGE over the ornamental water in Regent's Park has been commenced, Mr. Killingback being the contractor for the masonry, and Messrs. Hill & Smith for the ironwork. In the paragraph communicated to the *Times* nothing is said about the designer of the bridge, so we presume this is to be evolved from the artistic minds at the Office of Works. It might have been thought that in what are specially ornamental grounds some effort might be made to obtain a design from an artist-architect such as would add to the attraction of the place. The new bridge may turn out to be an ornament, but we cannot feel very sanguine about it. The bridge is described as "to be constructed with ornamental latticed girders, with moulded Portland stone pilasters at each end"; and we know pretty well what sort of commonplace that means.

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## BURY ST. EDMUND.

WHEN Mr. Evelyn went to stay with my Lord Chamberlain at Euston, in 1677, he was fetched from Bury in my lord's coach-and-six; and a day or two afterwards, hearing that a friend of his, Lord Crofts, lay dying at that town, he went over to visit him. When he had done his duty by his noble friend, he took a stroll "to see this ancient towne, and the remaines of that famous monasterie and abby." He records his impressions in a very few words:—"There is little standing intire save the gate-house; it has been a vast and magnificent Gotic structure, and of greate extent. The gates are wood, but quite plated over with iron. There are also two stately churches, one especially." What Mr. Evelyn saw two centuries ago, may still be seen to-day; but we, who live in an age of investigation, can probably tell more of the history of the ruins than could that gentleman, though he had lived two centuries nearer than we do to the time when they still had a history.

We quoted a fortnight ago Fuller's testimony to the magnificence of the abbey, how "the sun shined not on a fairer," and we then gave a very brief account of how the establishment gained its position as the premier abbey of England, from the extreme sanctity of the remains of St. Edmund and the wonderful miracles they brought. The royal saint quite overshadowed his predecessor, Beodric, who gave his name to the first collection of dwellings on the site,—Beodric's Worth,—and the mansion of the Saxon lord, as Jocelyn of Brakelond relates, became the dwelling of the Infirmarer of the abbey, a subordinate official, whose duty it was to look after the sick monks.

The first temple enshrining the sacred remains was of wood,—a large church, built more than 150 years before Harold died at Hastings, pierced with foreign arrows, as St. Edmund had been before him; but so soon as William the Norman was seated on the English throne he gave what help he could to the abbot, who was then building a vaster structure over the Saxon saint. Towards the end of the eleventh century the great church was finished, and fragments of it remain to this day,—not much, indeed, by which any date can be assigned to the work, but the curious in such matters may still see a moulded base to one of the great columns by the tower, whose flat and clumsy profile proclaims it to be of very early work.

This church was, indeed, an enormous affair. It was 472 ft. long inside, exclusive of the chapels at the east end,—longer than St. Alban's by 22 ft.; longer than Durham Cathedral by 58 ft.; only 2 ft. shorter than Salisbury, and 17 ft. shorter than Westminster Abbey. The neighbouring cathedral of Norwich could have been placed bodily inside it, with several feet to spare all round. Peterborough was only 8 ft. longer; Ely was 45 ft. The interior was of massive, heavy, Early Norman,—a barbarous style, strong, stern, and unrelenting, like those who used it. The sorrow experienced in beholding the ruins of so large a church is much mitigated on reflecting how grim the lines were of which they are the reminiscence. At the crossing of the nave and transepts was a large central tower. At the west end were five others. Truly, a magnificent group for the eyes of Abbot Sampson to rest on. The west front must have been one of the finest in Europe. It was a more magnificent Lincoln, a worthy companion of a complete Ely. When Abbot Sampson had finished the two flanking octagonal towers, he must, indeed, have felt proud to be the lord of such a fabric. He was a fortunate man, this Abbot Sampson, to whom it was permitted to build towers, and stables, and brewhouses to his heart's content, in the

crisp, clean, vigorous Early English, as simple, supple, and healthy as the bare limbs of little children. But all trace of his work is gone, except the concrete masses of the west wall, which might be of any date, and against which a modern house has leaned itself in a picturesque but unsanctified manner.

The site of most of the church can be identified with the aid of a plan, but without it the task would be one of hopeless conjecture. As it is, however, a little patience will enable you to traverse the length of the nave to the great central tower, and even to stand on the spot where the most sacred bones of the martyr rested for many centuries. By way of the north transept you may reach the chapter-house, whence the Lord Abbots issued their fiats; and the great cloister, which lent its name to the high-caste cloister monks, in contradistinction to the common herd of *obedientarii*, or officials. Further on the kitchen chimney-corner may be traced, and the porch and angle staircase of the cellarer's house. Fragments of the abbot's own house are also to be identified, and perhaps the piers of the infirmary cloister. But it all looks like masses of concrete. The line of a wall now forms but a bank, the floors are deeply covered over with turf. Well might one exclaim with the German students in one of their Gesellige Lieder,

> "O jerum, jerum, jerum!
> O quæ mutatio rerum!"

From the fields once devoted to silence and meditation now sometimes soars the rocket; instead of the shrine of St. Edmund, one may behold the fiery wheel of St. Catherine; the ancient tapers of the altar would pale their ineffectual fires before the modern Roman candle; and over the spot where cowled monks were wont to pace, fleet-footed, heavy-handed lads and lasses play a game called "kiss-in-the-ring." But, indeed, all those who care for antiquities may be glad that this is so. For had not the precincts of the ruined abbey been turned into public gardens, the ruins would hardly have been so well preserved.

All is not in ruin, however. The great gateway that was built at the same time as the circumscribing wall, early in the twelfth century, still remains; as also does another gateway built to defend the abbey against the burgesses. To realise the relations existing between the abbot and the townspeople, it is necessary to consider how great a man the abbot was. He was a peer of the realm. He owned no jurisdiction less than that of Rome itself. Were all the kingdom under an interdict, he had power, with closed doors indeed, "without ringing bells, and with a low voice, to celebrate divine offices." When King John was excommunicated, and the whole kingdom lay as dead beneath the blasting interdict, one small spark of life remained at Bury, where the abbot, with a low voice, still celebrated divine offices. Within a mile of the abbey every way the abbot was supreme,—he owned everything. Outside his stone walls were little besides wood or mud huts. A few stone houses there were, but not many. The townspeople were harassed by every species of toll and tithe and fine that the mind can conceive. The very refuse that lay in heaps before every door of that insanitary age was claimed by the abbot or his cellarer. At length, in the year 1327, for some reasons not recorded, but, like Antolycus's pretended stripes, they were no doubt "mighty ones and millions," the townspeople rose *en masse*, both men and women; from every village came large contingents; and at length about 20,000 persons hurled themselves against the abbey walls, led on, among others, by one Alicia Lickdish. They broke down the gates; burned Abbot Sampson's Early English stables and brew-house; beat and wounded the monks; seized the abbot, who was away at one of his manors; robbed him; nay, positively shaved him, and carried him over seas till he was ransomed by his friends. One result of this outbreak was greater freedom for the townspeople. Another was the beautiful gateway of the abbey, built with all manner of niches for peaceful saints, and loop-holes for warlike arrows. Built first and foremost for defence, and secondarily in honour of the saints, but withal so beautiful that no one has had the heart to destroy it.

Besides the two gate-houses there remains a stretch of wall along the north side, built about 1230. It leads to one of the most interesting features in Bury,—the Abbot's Bridge,—of about the same date. This bridge is a double or even triple erection. An inner series of arches carries a footway, an outer series carries the wall itself, while without this are flying buttresses, between which and the wall there is room to walk. It is said, not without reason, that planks were stretched from pier to pier, thus affording a footway outside the walls; but the structure, as now existing, throws no decided light on the matter. What with the double set of arches and the flying buttresses, however, the Abbot's Bridge is singularly picturesque.

The best preserved of all the remains of the former glory of Bury, however, are the two churches of St. Mary and St. James, the last built and longest lived. There was a third church, but all traces of it have disappeared, and had so long ago as Thomas Fuller's time. Both St. Mary's and St. James's are long churches, but, if one is to speak the thought of one's heart and defy the public opinion of Bury, they are not of the first order. The nave of St. Mary's is poor in detail, and even its length is against it; for, had it been shorter, there would have been less poverty. Its roof, however, is extremely good,—quiet and dignified. The nave of St. James's is not quite so long as St. Mary's, and has one arch less; its detail is decidedly better, and the whole effect, though it be heresy to say so, is more pleasing than that of its sister church.

St. Mary's, however, is the more interesting of the two, historically. It has some large tombs to Sir William Carew and Sir Robert Drury; but after the monument to Elizabeth Drury in Hawstead Church, or the Cordell monument at Melford, or the Kytson tombs at Hengrave, these tombs are Rabelaisian in their coarseness. An interesting tablet marks the last resting-place of Mary Tudor, daughter of Henry VII., widow of Louis XII. of France, and wife of Charles Brandon, Duke of Suffolk. Her history is a pleasant romance. Loved from infancy by the gallant and accomplished duke, she was married unwillingly, and for state reasons, to the aged King of France. Death came, but, like him in Schubert's song of "Death and the Maiden," he came "*nicht zu strafen*"; for luckily he spared the girl and took her aged husband, and forthwith she returned to her native land and married her first love. Her arms still adorn the entrance-gateway of West Stow Manor House, where they were placed by a devoted adherent, Sir John Crofts. This royal lady was originally buried in the abbey church, but on the destruction of that building, her body was removed to St. Mary's, being one of the few things that survived amid the universal desolation.

It is interesting to observe that neither of these churches had a fine tower. St. Mary's has a small one, but St. James's has none at all. This is hardly a matter of surprise, seeing that immediately behind it rose the five great towers of the west end of the abbey church. Indeed, it is somewhat curious that St. James's should have been built so close in front of the grand façade, which it must have half concealed.

Of the town of Bury itself not much need be said. Its architectural interest hardly extends beyond the precincts of the abbey. There are a few remains of Mediæval work; among them a house said to have been a Jew's house before the time of Abbot Sampson, who had all the Jews expelled. There could never have been much beside wood houses, and few of these survived the great fire of 1608. Fuller says the town "is sweetly seated and finely built," and, *mutatis mutandis*, the same may be said now. But the great glory of Bury must always be the memory of its abbey. Through five centuries it had but few rivals in dignity. The very name of its patron saint struck terror into guilty consciences and stayed the hand of the spoiler. Its abbot held the fate of thousands in his hand. Now, of all the names on its proud roll scarcely one is remembered. Abbot Sampson, indeed, lives in the pages of one of his obscure monks; but the others,—who knows or cares anything about them?

> "But yesterday the word of Cæsar might
> Have stood against the world; now lies he there
> And none so poor to do him reverence."

But, though a man's name dies, his work, if worthy, will live; and if one might but leave behind one anything so excellent as the Gate-house or the Abbot's Bridge, one might well suffer one's personality to evaporate with equanimity.

## THE ANCIENT AQUEDUCT AT SAMOS.

At the close of his charming account of the tyrant Polycrates, Herodotus tells us (book iii., cap. 39–60) that he had lingered over the story of the Samians because in their island were three of the most wonderful works he had ever seen. First and foremost of the three was a tunnel bored through a mountain 150 fathoms high. The length of the tunnel, he goes on to say, was seven stadia, the height and the breadth 8 ft. each way. Through the whole length of this tunnel there went a second tunnel 20 cubits deep and 3 ft. wide, through which the water is carried along in tiled pipes and conveyed to the city from a great spring. The architect of this tunnel was a Megarean, Eupalinos by name, son of Naustrophos.

It has been the fashion of late to regard the father of history as the wildest of romancers, but the fact of the execution of this tunnel, surprising though it seems as a work of the sixth century B.C., has been placed beyond doubt by recent excavations. Travellers since the beginning of the present century have known of its existence; a short notice of some of the obvious points in its construction appeared in the *Academy*, Nov., 1882, p. 335, and finally, during the spring of the present year, it has been thoroughly investigated by a member of the German School at Athens, Dr. Ernst Fabricius. He finds, as we might expect, that except for a few trifling errors in measurement, the actual remains tally closely with the account of Herodotus. His account is as follows:—

The aqueduct falls naturally into four divisions. (1) The spring itself, with the building over and about it. (2) The portion of the aqueduct leading from the spring to the intervening hill. (3) The tunnel proper through the hill. (4) The aqueduct from the hill to the town.

Fortunately, about the spring itself there had never been any difficulty. There is only one spring of any considerable size that did correspond to the "Great Spring" (ἀπὸ μεγάλης πηγῆς) of Herodotus. This spring is marked by three chapels to St. John, known among the natives of the island as the "Hagiades." There is no doubt, therefore, whence the aqueduct started. It is between this spring and the port of Samos, the modern Tigani, that the mountain ridge intervenes. Never was a town worse situated with respect to its water supply. Either the mountain must be tunnelled or the water led round the base by a long awkward circuit. Portions of the well-house structure still remain, and are, in fact, still used by the natives. It consisted of a building in the shape of a right-angled triangle, with a slightly rounded hypotenuse, the roof supported by fifteen pillars. Second comes the portion of the aqueduct between the well and the tunnel proper. Here the conduit was about the height of a man, partly hewn out of the solid rock, partly built up out of masonry. It is about 853 mètres in length. Lying about in this part have been found large quantities of cylindrical tiles, no doubt either the brick pipes (σωλήνων) mentioned by Herodotus, or at least their modern successors.

Third, we come to the tunnel proper. The merit of having discovered the actual mouth of the tunnel belongs to the present abbot of the neighbouring monastery of the Hagia Trias. For five months he and a fellow abbot of the Monastery of Stauros superintended the labour of fifty workmen, and laid bare the entrance and a part of the tunnel itself. It would be much to the advantage of the inhabitants of the modern Tigani if the work could be completed and they could be supplied with good drinking-water after the same fashion as their ancestors of the time of Polycrates. Unfortunately the investigation of the actual tunnel is still in part, owing to the insufficiency of the props, a matter of considerable danger. On the south side it is accessible for 500 mètres, on the north for 100 mètres. Except at the entrance and the exit, where it is supported by masonry, the tunnel is bored through the solid rock. Abundant marks of hammer and chisel still remain, the work never having been finely finished. Along the walls niches are frequently found, and in some the very lamps remain which served to light the workmen. A little to the south of midway an interesting fact comes out. About 425 mètres from the mouth, in a southerly direction, the tunnel ends in blank rock. It is clear that the boring was begun

from the two sides of the mountain. A slight error was made, and hence one of the bores comes to this blank end. The error was rectified by digging down till the lower bore was struck, and, just as we should expect, we find that at the meeting-point the tunnel is, instead of being just large enough for a man to stand upright, as high as 4 to 5 mètres. At either end of the tunnel proper the walls are, as we said before, supported by masonry. On the north side much more masonry is needed for support than on the south. There is evidence that at first the supports were of wood, ultimately replaced by solid stone.

It is this third portion of the conduit, *i.e.*, the tunnel proper, that alone aroused the admiration of Herodotus. We remember he says that within the tunnel there is a second tunnel or dyke 20 cubits deep. Such is in reality the case. The water does not flow through the tunnel, but in a deep ditch dug beneath it. It is at the bottom of this ditch that the brick pipes are laid. Unhappily, Herodotus gives us no clue to the reason of this curious and complicated arrangement. Dr. E. Fabricius conjectures that this second arrangement was made after the first tunnelling, and in order to correct some error in the necessary level of the water supply. The tunnel seems to have been in use in Roman times, small chambers hewn in the rock seem to be Roman work. They supplemented the aqueduct, however, by a second supply of water brought round the mountain. We have also traces of early Christian influence. About 20 in. from the central meeting-point of the two bores we come upon a small rock-hewn chamber, in which are a number of white marble pil'ars and some marble slabs, all much incrusted with stalactites. On one of these, when cleaned, were found unmistakable traces of a Byzantine style of ornament. No doubt the little chamber was used as a shrine. Last, we come to the fourth section of the aqueduct, the portion that leads from the tunnel-exit to the town. The end of the main conduit has never been found, probably it came out near the shore, where good drinking-water would be specially needed. Close to the harbour lay the ancient Agora, and according to an inscription found built into the walls of the modern Tigani, there was in this Agora a stoa which contained two elaborate klepsydræ, or water-clocks, which told the water-drawers month, day, and hour. As there is no spring in the neighbourhood of Tigani which runs the whole year round, we may reasonably suppose that these marvellous klepsydræ were worked by the water that came through the tunnel of Eupalinos. Possibly the tyrant Polycrates had a taste for the marvellous in water-clocks as well as rings.

## THE WARMING AND VENTILATION OF FRENCH SCHOOLS.

The determination to render education compulsory throughout France, which was unanimously approved after the establishment of the Republic, has helped to develope considerably those sciences that contribute to preserve the health of those who live in large institutions. The educational movement was in reality a political, we might almost say a military, movement. It was based on the hope that the day might arrive when France would regain her military ascendancy; but it was felt that a successful war could only be waged by an educated people. Yet, on the other hand, physical education was recognised to be as necessary as mental training, and, therefore, unprecedented attention was given to the hygiene as well as to the curriculum of schools. Good light, a plentiful supply of air, constant exercise, abundant food, sufficient warmth, and even improved drainage, were all recognised as forming the fundamental conditions of a national regeneration. And now that some years have elapsed since this movement originated, work has been done, and new schools have been built, that redound greatly to the credit of the French nation, and must infallibly contribute to the improvement of the rising generation. We have just visited some of these modern institutions, and they merit the attention of English architects. Apart from the general adoption of the unilateral light in most schools, the system of warming is based on a rational conception which has given the best results.

At the instigation of Professor Emile Trélat, the distinguished architect, and with the assistance of Messrs. Genest and Herscher, the well-known engineers, the Society of Public Medicine and Professional Hygiene drew up a report and propounded the general principles that should govern the warming and ventilating of schools, &c. These principles, which we are about to describe, have left the domain of theory, for they are applied on a large scale throughout France. Of course the first stipulation is that schoolrooms should have windows on both sides, so that a through-draught may be created as soon as the class is over. But, apart from this, the great object is to create as many inlets of pure air as possible with corresponding outlets. This end is attained by admitting large volumes of air slightly warmed, instead of a small quantity at a high temperature. Further a condition is imposed to the effect that each class-room should be independent of its neighbour, and capable of being warmed or not as circumstances may arise. How this programme has been carried out we were able to see for ourselves by visiting two typical schools in Paris; the first, in the Avenue Rapp, frequented for the most part by the children of the workpeople employed at the Government tobacco factory, and the second a middle class school in the Rue d'Amsterdam, known as the Lycée Condorcet. In both cases, the disposition of the rooms was very similar and the unilateral light secured. To the left of the pupils the wall had large bay-windows overlooking a wide court or the street. On the right-hand side was the entrance-door and smaller windows carefully closed with wooden shutters, so that no conflicting rays of light should enter during class time. In all cases, the door gave upon a verandah or open passage, protecting the wall from the sun, but at the same time offering none of the inconveniences of a corridor. The warming and ventilating had been installed by Messrs. Genest and Herscher, in keeping with the principles accepted by the Society of Public Medicine. In the Avenue Rapp each class-room had a stove placed in the corner nearest to the outer wall and the master's desk. The chimney, instead of being taken up to the ceiling, ran horizontally along the outer wall, immediately below the window-sill. Being enveloped by a metallic casing, it is impossible to touch the chimney. A sort of elongated heat-box is thus created, fed with fresh air brought in directly from the outside by intakes made through the wall. The casing is, of course, perforated throughout, and the air, warmed by passing over the outside of the stove-flue, enters the room. It does not suffice to warm a room, but it tends to the even diffusion of the warmth. In old schools it often happened that while one pupil near to the fire was scorched another at the other end of the class was almost frozen. To prevent this, the pure air admitted should be at as low a temperature as possible. If it is warmed too much it will rise up to the ceiling before the pupils have had time to breathe it. Even if the air be chemically pure, we know that it has an unpleasant, often an unhealthy, effect, when warmed too much; therefore to avoid the necessity of over-heating the air, the idea of protecting the walls against the refrigerating action of the external temperature was suggested. If the wall is warm, colder air may be introduced within the room. Again, a cold wall will determine a down-current of the vitiated air that has collected in the upper portion of the apartment. When, however, the flue from the stove runs horizontally along the outer wall, it counteracts this influence, it neutralises the chilling effect of the large windows. Further, the heat of the smoke and the products of combustion being utilised, a great economy in fuel is attained. The chimney or flues, after travelling horizontally along the outer wall of the room, is conducted upwards to the roof; but it passes in the centre of an air-shaft, and the remaining heat of the flue is further utilised to extract the foul air from the school. For this purpose the shaft has an opening near the ceiling of the room, and gas-burners placed within are sometimes employed to increase the suction. This system is very economical, is easily carried out, and well suited to small rural establishments. At the Avenue Rapp it is applied on a large scale, but the elementary character of the school increased the necessity of economy.

Counting fifty pupils for each class-room, the installation of the heating and ventilation amounts in cost to 18 or 20 francs per pupil. It must be borne in mind that the material employed is very dear and heavily taxed in Paris, and that the workmen's wages are higher than in any other part of France. The outlay would not be so great in rural districts. As for working expenses, these need not be taken into consideration, for there are no attendants, the master himself adding coal to the fire whenever necessary. A coal yielding very little smoke is used. It is extracted from the Charleroi or Pas-de-Calais Mines, and is commonly called *gailleterie*, and might be compared to our Cardiff coal. In Paris it is sold at 1*l.* 12*s.* to 1*l.* 16*s.* the ton. Nevertheless, in spite of the high price for fuel, the cost for warming and ventilating the primary schools installed in Paris in the manner we have described, only amounts to two centimes per head per day. This is equal, in other words, to a penny per day for five pupils. These figures will compare most favourably with what has been done in England; and, though we have not had an opportunity of testing whether the warmth given in winter is sufficient, we found a plentiful supply of fresh air in the many class-rooms we entered during the great heat of July.

More perfect, but more expensive and elaborate, the warming and ventilating of the Lycée Condorcet is a good illustration of the modern system and of the newest improvements. The class-rooms, so far as light and ventilation are concerned, are disposed in the same manner; but they are warmed by steam under slight pressure. The steam is generated within a multitubular boiler of the Naeyer de Willebroeck type, so as to avoid all risk of explosion. From the basement, where the boiler stands, the steam goes straight up to the attic, where it passes through a reducing valve. This apparatus is round in shape, and divided by a copper disc or plate, which becomes either convex or concave as the pressure or expansion pushes one way or the other. By the movement of this plate the steam supply is so regulated as to be always at a very low pressure. This has the advantage of insuring an even distribution; otherwise the steam, if at high pressure, would rush into the first opening instead of travelling slowly but surely over the whole building.

In the place of the chimney from the stove we have two steam coils passing along the wall of the class-room. The upper and larger coil gives off a considerable quantity of heat. It is placed as near as possible to the bottom of the window to counteract the chilling influence of the large surface of glass. The fresh air from the outside is admitted at a height of only a few inches from the floor, and here it is only slightly warmed by passing over the second and much smaller steam coil. The air is really not warmed, the chill only is taken off. The side walls are also warmed by a steam coil; thus no down-draught can occur, and the pupils are enveloped all round with heat that radiates upon them, and that is distributed in proportion with the causes of cold. Thus the same temperature is noted in every part of the room. The fresh air entering almost on a level with the floor is warmed and vitiated as it rises and comes in contact with the pupils. But then it continues to travel upwards till it reaches the ceiling, where it is drawn off by shafts communicating with lanterns in the roof containing gas-burners or other contrivances to accelerate the up-current.

Further it should be noted that the whole of this system is regulated from the outside without in any way disturbing the pupils during their studies. An attendant goes the round periodically of each class. A small opening in the wall, protected by glass, enables him to see a thermometer placed within the class-room; and, according to the degree of heat recorded, he turns the steam on or off. The fact that the supply of heat for each room is in this manner absolutely independent is a most important consideration. One class-room, crowded with pupils, may require ventilating rather than warming. At the same time the next room may be differently situated, and, exposed to colder winds and with fewer pupils, would want very much more artificial heat. These exigencies are met by the use of a steam trap, invented for this express purpose and applied to each warming apparatus. This trap allows the escape of water and air into the main return pipes, but retains the steam. There is, consequently, no counter pressure from the return main pipe, and, therefore, the supply given to any one room can be entirely stopped or resumed at will. Such modification in no wise affects the neighbouring rooms. Now that these

facilities have been created, the greatest severity is displayed in the matter of maintaining even temperature. For the winter months this is fixed at 15 degrees to 16 degrees centigrade (58 to 60 F.), and, if a variation occurs exceeding one degree centigrade either way a reprimand, and even punishment, is inflicted.

The Lycée Condorcet is a superior school, built in a very crowded district, with places for 600 pupils. The impossibility of obtaining sufficient land rendered it necessary to build to the height of four stories. The installation of the apparatus, &c., for warming and ventilating amounted to 4,080*l.*, or a little over six guineas per head. The working expenses for coal, the stoker, the attendant, &c., amount to 340*l.* per annum, but, of course, the results attained are far more reliable than in the primary schools, where a mere stove alone is employed.

## THE CAMBRIAN ARCHÆOLOGICAL ASSOCIATION.

The annual congress of this association was held last week, when Sir Watkin Williams Winn took the chair, as president, and opened the proceedings of the thirty-ninth annual meeting.

On Tuesday an excursion was made up the left bank of Bala Lake to Castell Corndochan. The Rev. W. Hughes, the local secretary, read a paper, in which he referred to the leading objects of the day's excursion,—Caergai, Castell Corndochan, and Llannwchllyn Church. "Llannwchllyn" was derived from its position above Bala Lake. Llan-nwch-y-Llyn, the church above the lake. In early times, he said, the word "Llan" was not only applied to churches, but it also signified the spot surrounding the church. The existence to these days of so many Llans bearing the names of Welsh saints, such as Llandudno, Llandewi, Llandaff, and Llandrinio, showed the independence of the early British Church of the Church of Rome, and that she had a noble army of saints and martyrs to boast of long before Augustine came over from Rome, A.D. 596, to preach the Gospel to the pagan Saxon. The parish of Llannwchllyn was one of much archæological interest, not the least point in which was that the historical river Dee rose in it under the hill called Duallt, and not at Pantgwyn, as was sometimes supposed. Some writers asserted that the Dee did not acquire the name at any higher point than where it emerged from Bala Lake; but the tributaries to the lake are so well defined that one of them must be the Dee. The tributaries are the Twrch, Afron, Llan, or Little Dee, the Llyn, and the Llafar. The Welsh name of the Dee was Dyfrdwy, which was variously derived, Dwfr-dwy-afon, from the fact of its springing from two sources. Giraldus called it Deverdorn. Might not, he asked, the word "Dee" be an Anglicised form of "Da," and "Deva" a Latinised form of the Anglicised word "Dee"? No river in the kingdom presented a more fertile source for archæological research than the Dee.

Caergai, the next place of interest in the day's excursion, was described by Mr. Hughes. Camden said it was at one time a castle, built one Caius, a Roman, while the Britons assigned it to Gui, foster-father of Arthur, which seemed to be the view adopted by Spenser. In that case, Caergai would be a British and not a Roman fort. Pennant, however, favoured the theory that it was a Roman fort, and mentioned the discovery of many coins there. Roman tiles had been found in abundance about the houses and fields, and round bricks may be seen now, probably the remains of hypocaust pillars. Traces also remained of an old Roman pond diverging towards Mons Hriri through Prysam, Castell-y-Wann, Mvel Strodyd, Cwm Pryser, and Lwm Helen. Castell carn Dochan, the next place of interest, was described as situate on an imposing situation, on a precipitous projection of Ifud-helyg-y-Moch. The ruins form an inner parallelogram, 24 ft. by 20 ft., with walls 6 ft. thick, defended by a wall of loose stones and other walls. The bare walls simply remain, and there are no architectural details. The portion now exposed probably formed the dungeon and cellars of an old fort, perhaps a fortress in times of trouble. Diggings were made in 1828 and 1872, but only charcoal, burned soil, bones, and pieces of lead were found. At the foot of the Castell carn Dochan is a place called "Ller Llys," or place of the Court, or Manor-house. Llannwchllyn Church, the last but not the least interesting object in the day's excursion, was dedicated to St. Duniol, and, with the cathedral of Bangor and the parish church of Hawarden, were the only churches in North Wales that bear the name of the first Bishop of Bangor.

At Llannwchllyn Church the objects of interest were a curious brass almsplate, an old oak-covered baptistery, shaped like a hip-bath, and a full-length effigy of a knight in armour with a hound at his feet, and the inscription, "Hic Iacet Iohannes ap Gruffyt ap Madoc ap Iorworth cuius an. me. P. itur Deus Amen. Anno Dni. mcccIxx." The records of this church appeared to be in a very sad state of neglect from damp and mutilation, those previous to 1675, so it is said, having been presented by a rector of the parish about the beginning of this century to some shoemaking friends of his who found the vellum useful for trade purposes! A move was made from this place for Llangower, a small church between the road and the lake, where a dilapidated old timber structure was pointed out as a fairly representative horse-bier upon which the coffin used to be borne palanquin fashion, the bearers being horses placed between shafts 5 ft. 8 in. long by 2 ft. 3 in. across. The coffin rested on eight elm "thwarts," some of which in the present instance appeared to have been recently replaced. Plâs Rhiwaedog, an old mansion believed to have been once occupied by Llywarch Hên, the poet-prince of those parts, early in the seventh century, was next visited. Colonel Evans-Lloyd read a brief but highly interesting paper on the place and its history.

On Thursday, the 21st, the members visited the Vale of Llangollen, and were occupied in investigating the ancient remains of the neighbourhood. The chief point of interest was a "tommen," or Roman mound of observation, situate a short distance from Maentwrog, called Tommen-y-Mur (*Hereri Mons*). This Tommen-y-Mur is a conspicuous tumulus within a large parallelogram formed of a strong vallum and ditch. On both sides of the tumulus another strong vallum has been thrown up, dividing it into two equal parts. The approach to this is well guarded by lines of defence, and in one portion a section of Roman paved way, four yards in width, was hit upon. At a distance of a few hundred yards to the north-east, and near the point where two Roman roads cross each other, is a very fine amphitheatre nearly circular, the distance north and south being 114 ft., and east and west 104 ft. These have before been noticed and have been described in the journal *Archæologia Cambrensis*. A visit was also paid to the ruins of Cymmer Abbey, which lie hidden amid trees, and which form part of the buildings of a farm-house. From the confirmation charter of Llewellyn ap Iorworth, Prince of North Wales, dated 1209 (according to Dugdale's "Monasticon"), to the Abbot and monks of Kemmer, of the Cistercian order and Benedictine rule, serving God and the blessed Virgin, it appears that the abbey was founded by Meredyd and Gruffyd, the sons of Cynan (referred to above), and that associated with them, probably as a late benefactor, was Howell, the son of Gruffyd. The form of the building is unusual for a Cistercian building. The plan is not cruciform, but consists of one continuous long nave and western tower. At the west end is an arcade opening into a chapel, the walls of which are continued to the east end of the church and form a lean-to, but shut out from the church. It may probably have been a sacristy. There are no remains of cloisters, and the chapter-house and other buildings have disappeared, but a little to the west of the church stands the ancient guest-hall or Abbot's hall (now used as a domicile), and has an open oak roof. Other buildings are also to be seen at the west end, but east of the guest-hall.

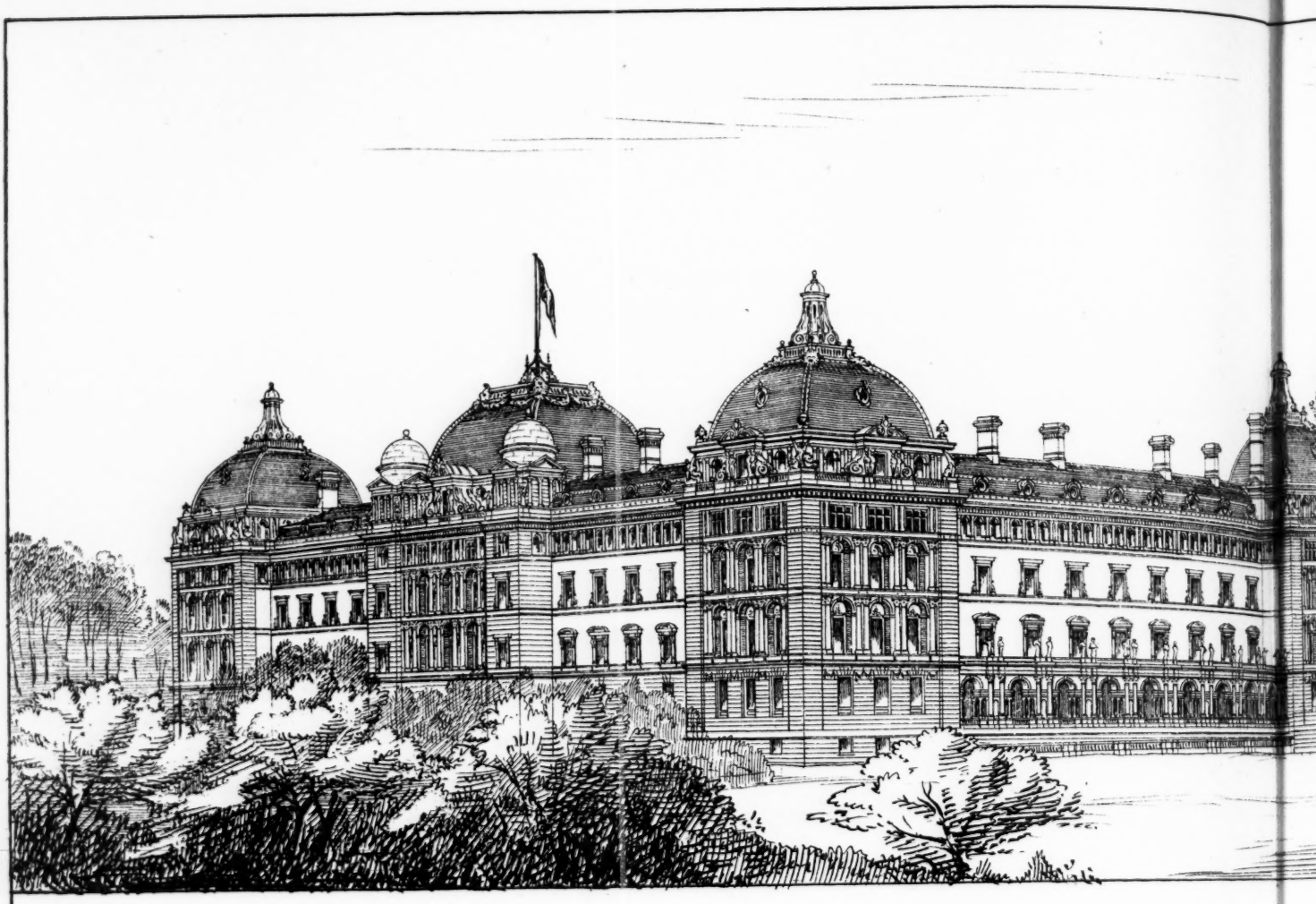
On the 22nd the excursion was among the Berwyn mountains, and the antiquities in the district around Llangollen were also examined.

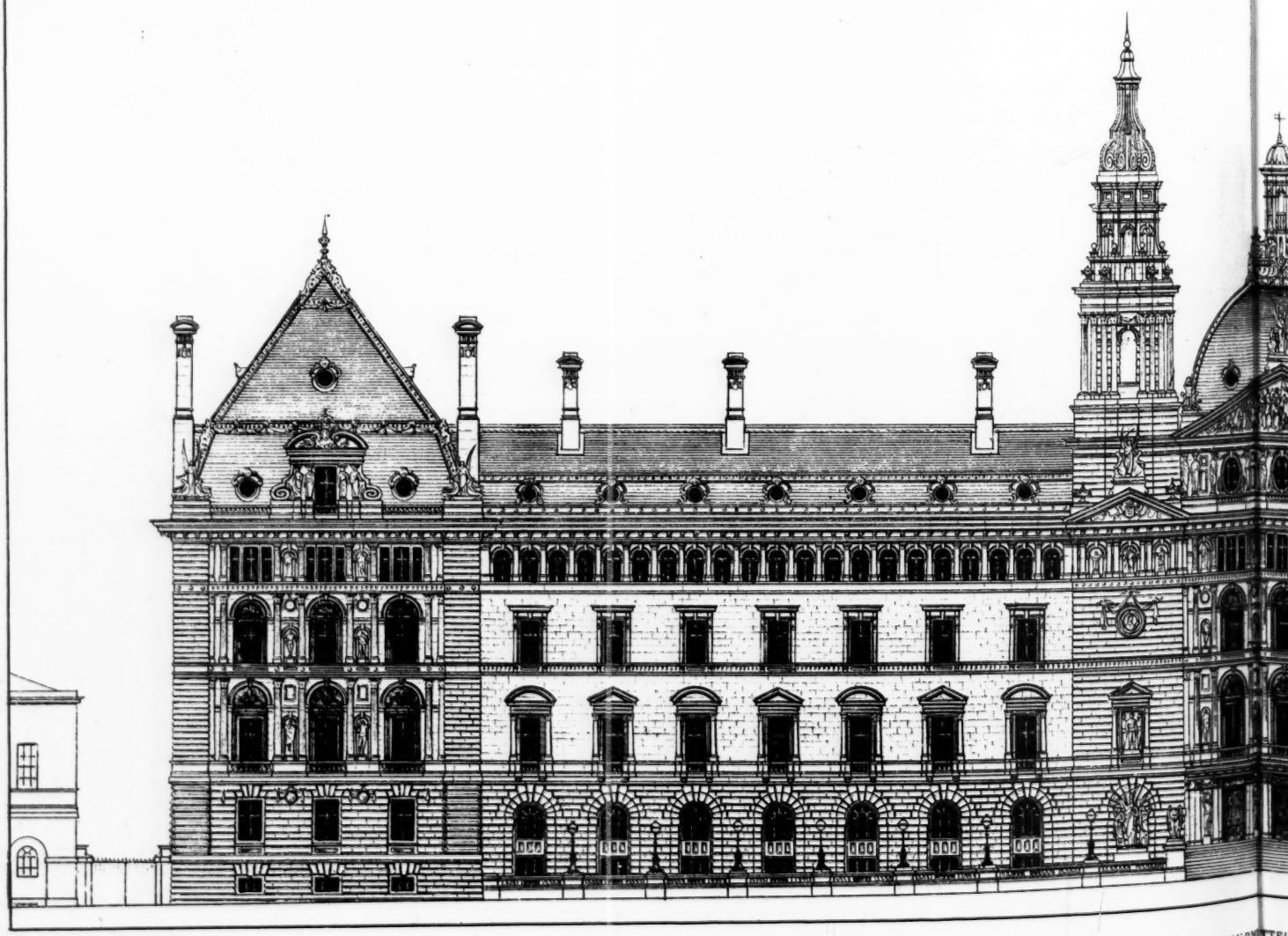
After visiting Llantysilio Church, the travellers reached Valle Crucis Abbey,—a ruin romantically situated in a leafy hollow among the hills. The stone fragments have been carefully collected together and placed as nearly in their original positions as practicable on the carefully-shaven turf which now takes the place of the paved floor of the abbey. A slab in the south wall of the nave records that by permission of the proprietor the levelling and clearing of the ruins of the abbey was effected under the superintendence of Arthur Viscount Dungannon, of Brynkinalt, and Mr. W. G. Wynne, of Penarth, and occupied from May, 1851, to May, 1852, Mr. Penson, of Oswestry, being the architect. The chapter-house, on the south side of the abbey, was still left untouched; it was in fact used as a farm-house up to the spring of 1883, and the walls and fine vaulted roof were plastered over. All this has now been removed. Over the chapter-house were the dormitories of the monks, and in front of the chapter-house still runs a clear stream of water, as it has done by repute for ages past. In the restoration of the chapter-house a curious plan was adopted for preserving a memorial which is believed to have no proper connexion with the abbey itself. This is a monumental slab on which the vine, Maltese cross, &c., are carved, which is built into the south wall over the central one of three recesses. The church is of the usual cruciform type,—an aisleless presbytery, transepts, with two chapels forming an eastern aisle to each. There was a low square tower over the crossing, and a nave of six bays, with two side aisles. The extreme length is 165 ft.; length of transepts from north to south, 98 ft.; width of nave and aisles, 67 ft. 6 in.; width of chancel, 30 ft.; and of the transepts, 30 ft. The two end gables stand out almost perfect, and the north and part of the south walls of the chancel remain as described in the Journal of the British Archæological Association.

Another important feature in the day's programme was Castell Dinas Bran, which is locally known as "Crow Castle," and which proves a most conspicuous object, as seen from the Vale of Llangollen, in the neighbourhood of that town. It stands on the summit of a conical hill, 600 ft. high, among other surrounding mountains. Its broken walls and jagged turrets, as seen from below, form a striking feature in the landscape. It must have been impregnable against any attack when fortified in the days of rude warfare. Its early history appears to be unknown, but, according to history, it was in 1200 the residence of Madoc ap Griffith, the founder of Valle Crucis, from which it is distant only two or three miles. Madoc, it appears, became a traitor to his king, and when he afterwards gave in his submission it was readily accepted, for the probable reason that the sovereign was aware of the impregnability of his castle, to which he had retired.

We are partially indebted to reports in the *Cambrian*, the *Western Mail*, and the *Times*, for the foregoing particulars of the proceedings of the Congress.

**Messrs. Seeley's New Premises in Essex-street, Strand.** — The east side of Essex-street in the Strand is at present undergoing an architectural improvement by the erection of an extensive block of new buildings for Messrs. Seeley & Co., of Fleet-street, the well-known publishers. The building, 62 ft. in height, and 48 ft. in width, will have an attractive and richly-carved frontage, the elevation towards the street level comprising four lofty stories, besides dormers. The building up to the second-floor is faced with Portland stone, ornamented at the angles and between the windows with Minton Hollins & Co.'s herring-bone red tiles in varied patterns. The elevation is enriched with elaborate carving and sculpture on the entablatures. Within pediments above the second-floor windows are allegorical figures, whilst other parts of the frontage are filled in with devices emblematic of literature, science, music, and the arts. The panels at the foot of the several windows are likewise all filled in with foliage. The whole of the carving and sculpture is being executed by Mr. Mullins. The first and second floors contain ranges of five-light projecting bay windows, oriel in form. The upper portion of the frontage, containing the third and fourth floors, is faced with red brick, and the elevation is surmounted by an ornamental central pediment, 12 ft. in height above the main cornice. The roof will be covered with pea-green slates. The basement, ground, and the third and fourth floors are intended to be entirely occupied by Messrs. Seeley & Co., whilst the first and second floors will be let as offices, to which there is a separate entrance. Mr. H. C. Boyes, of Bow Churchyard, is the architect, and Messrs. J. & J. Greenwood, of Maltby-street, Bermondsey, are the contractors. Mr. W. B. Lee is foreman of the works.





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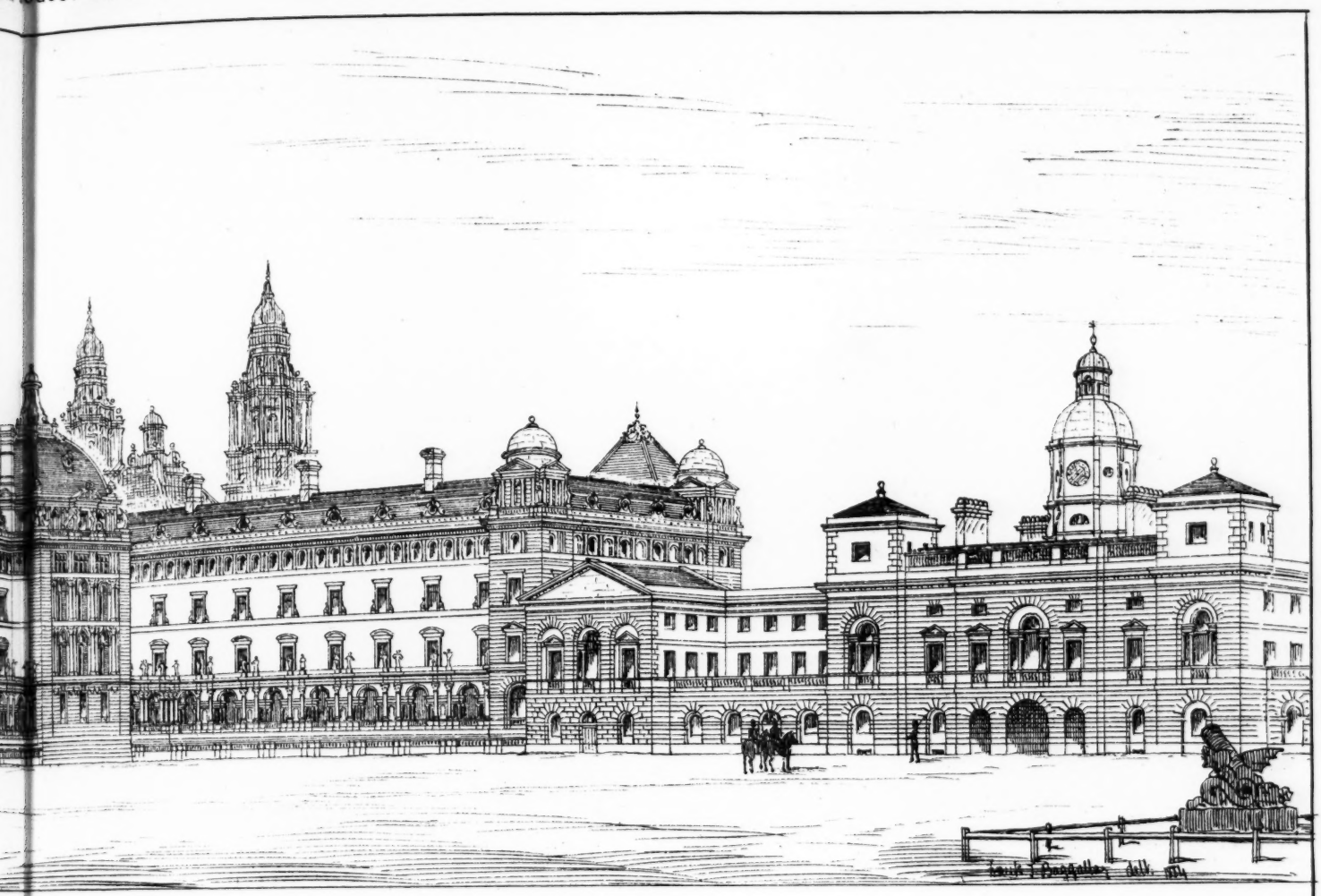
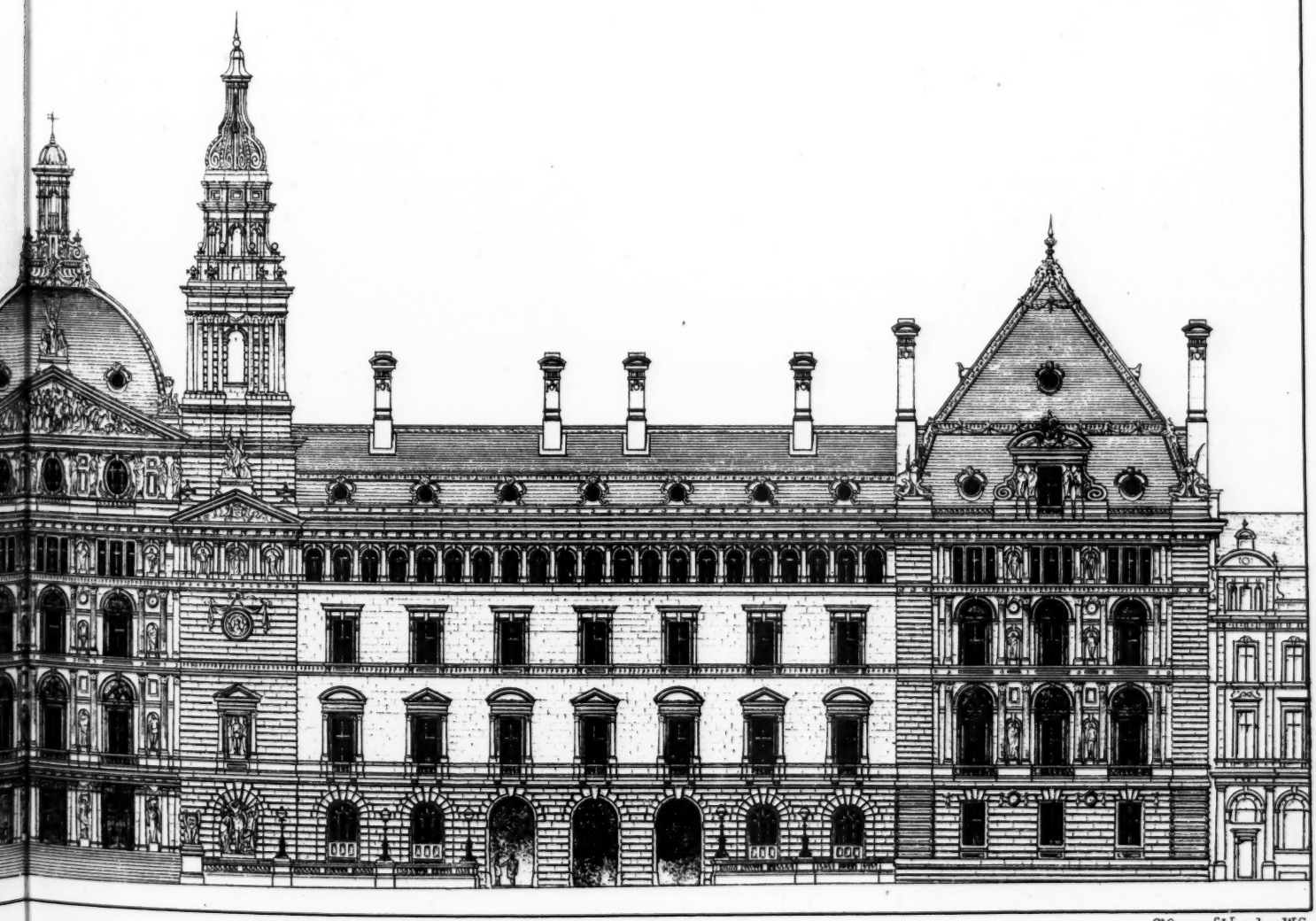
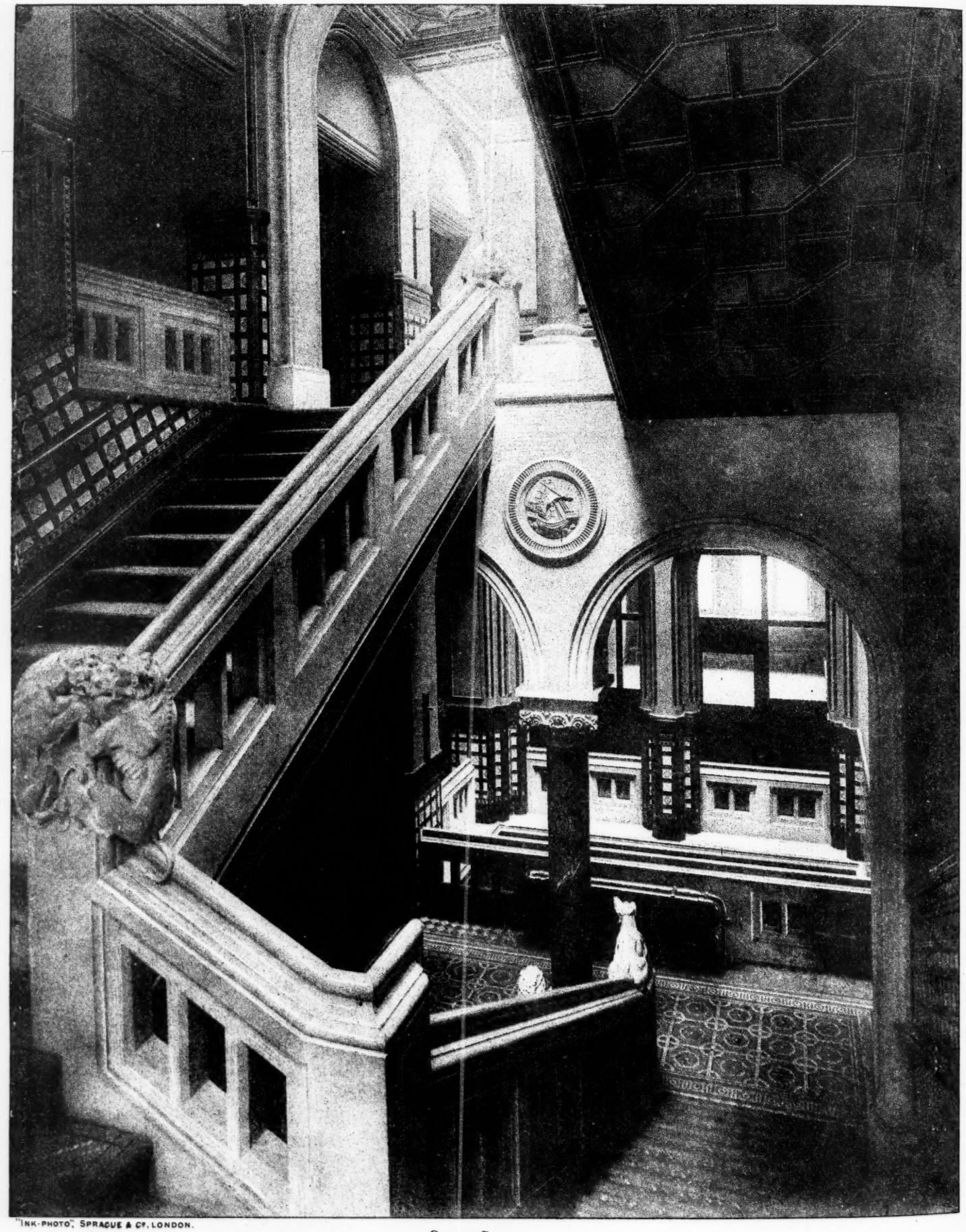
PROPOSED NEW ADMIRALTY AND WAR OFFICE.—DESIGN SUBMITTED





C.Queen St. London.W.C.

SUBMITTED IN FIRST COMPETITION, BY MESSRS. I'ANSON & SON, AND F. T. BAGGALLAY.



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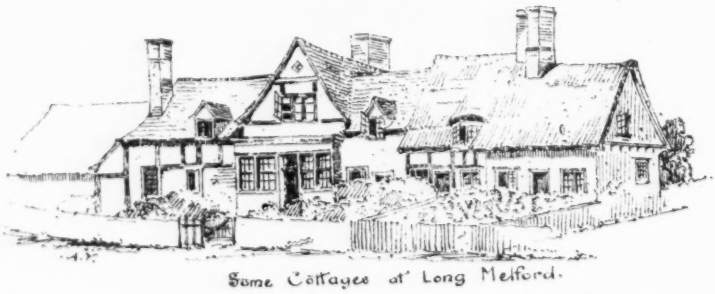
OFFICE STAIRCASE.

## LEEDS MUNICIPAL OFFICES, Mr. GEO. CORSON, ARCHITECT.

*From Photographs by Mr. E. Wormald, Leeds.*

A Corner of Hengrave Hall.

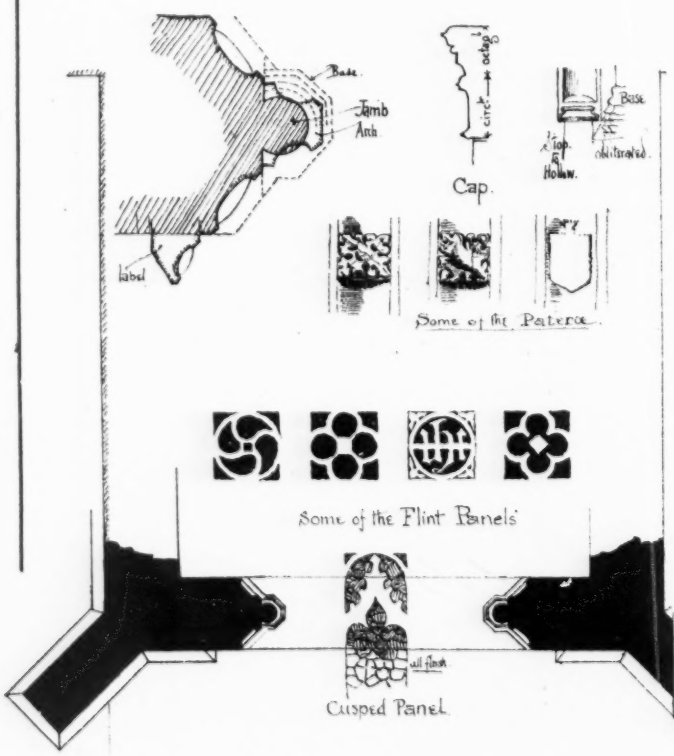
Hawstead Church Tower.

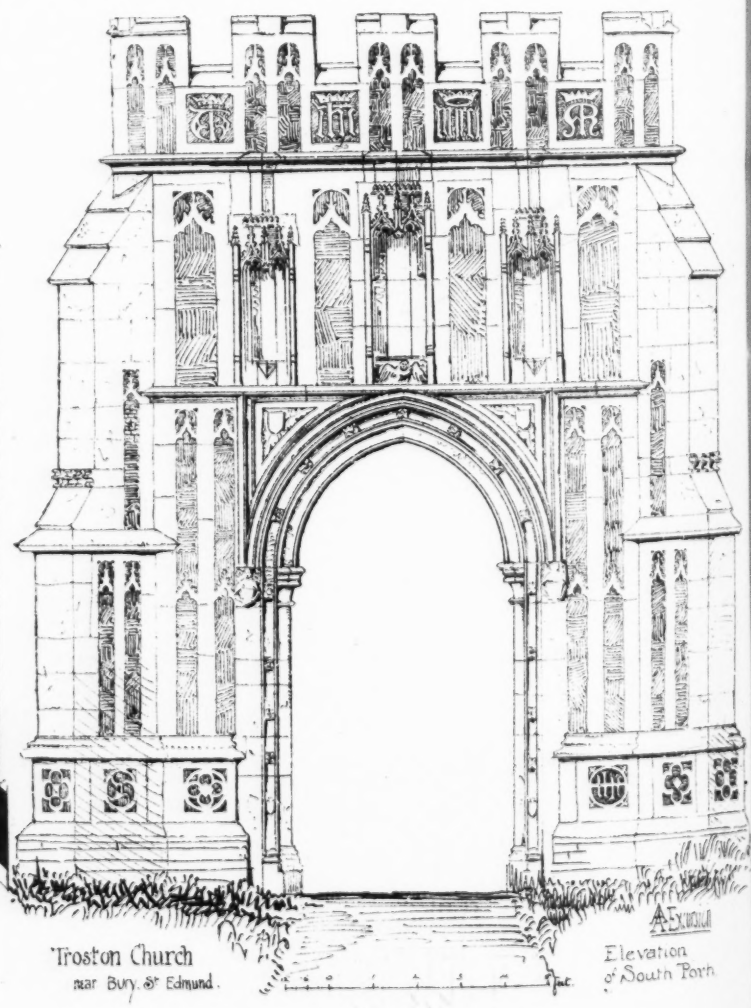


Some Cottages at Long Melford.

Livermere Magna Ch.

Troston Church
near Bury St Edmund
Plan & details of South Porch

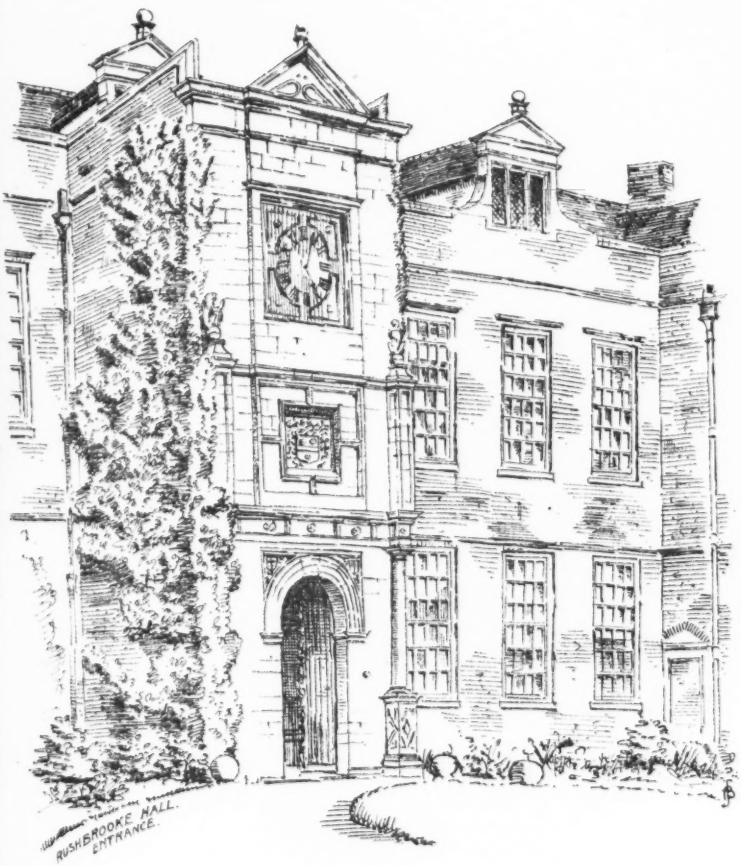


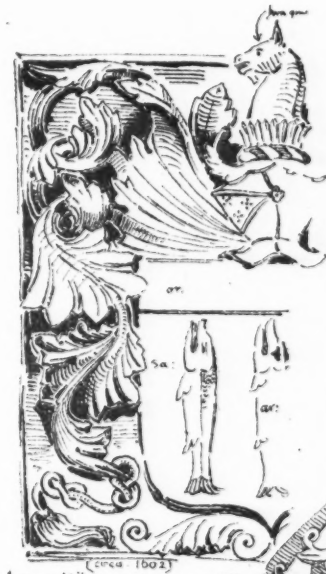



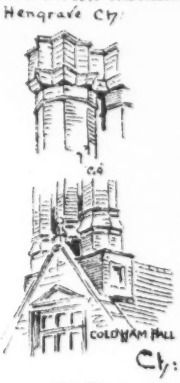
Troston Church
near Bury St Edmund.

Elevation of South Porch

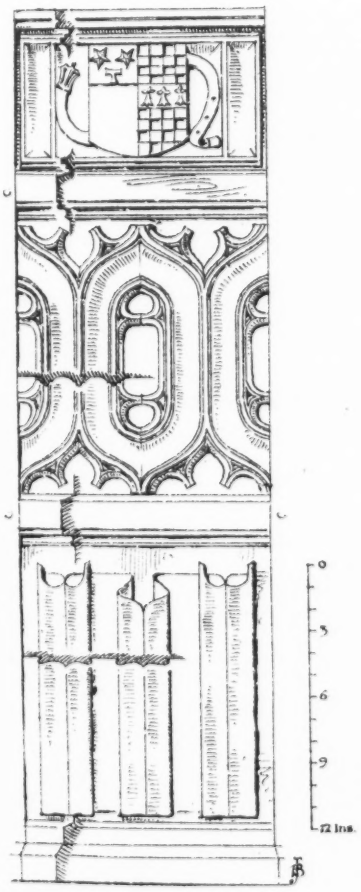
C F Kell Photo-Lith & Printer



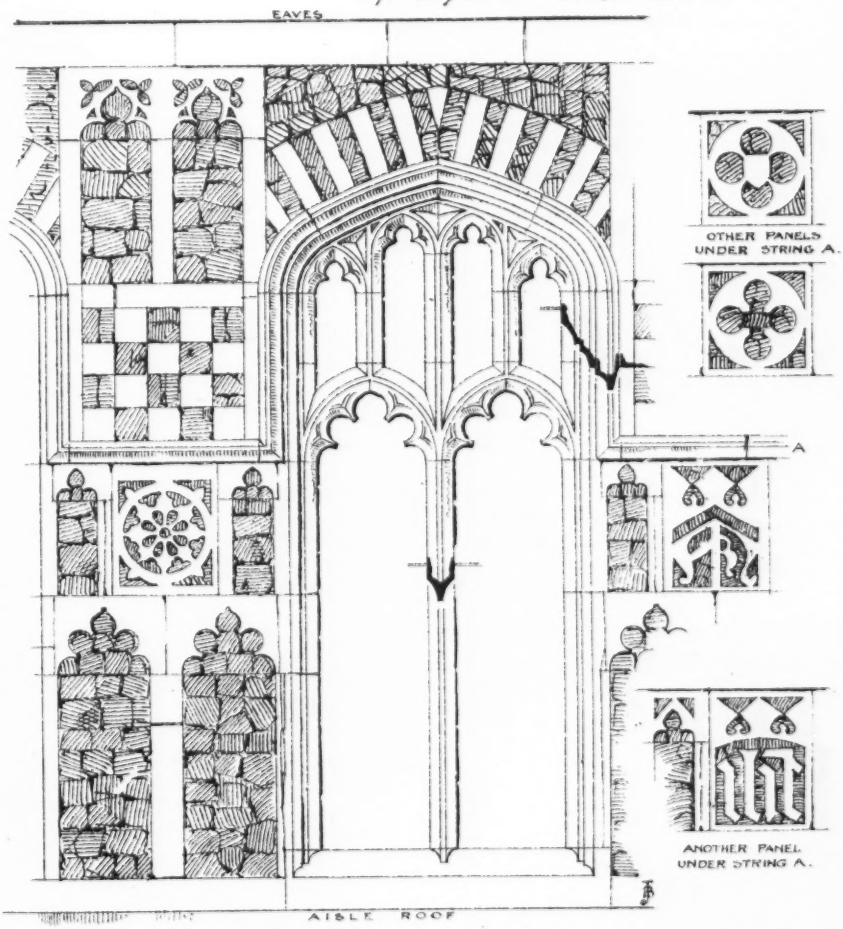





Ch: Richard Pink. del.




HAWSTEAD CH. ONE SIDE OF PULPIT.







Woolpit Ch: One Bay of Clerestory.

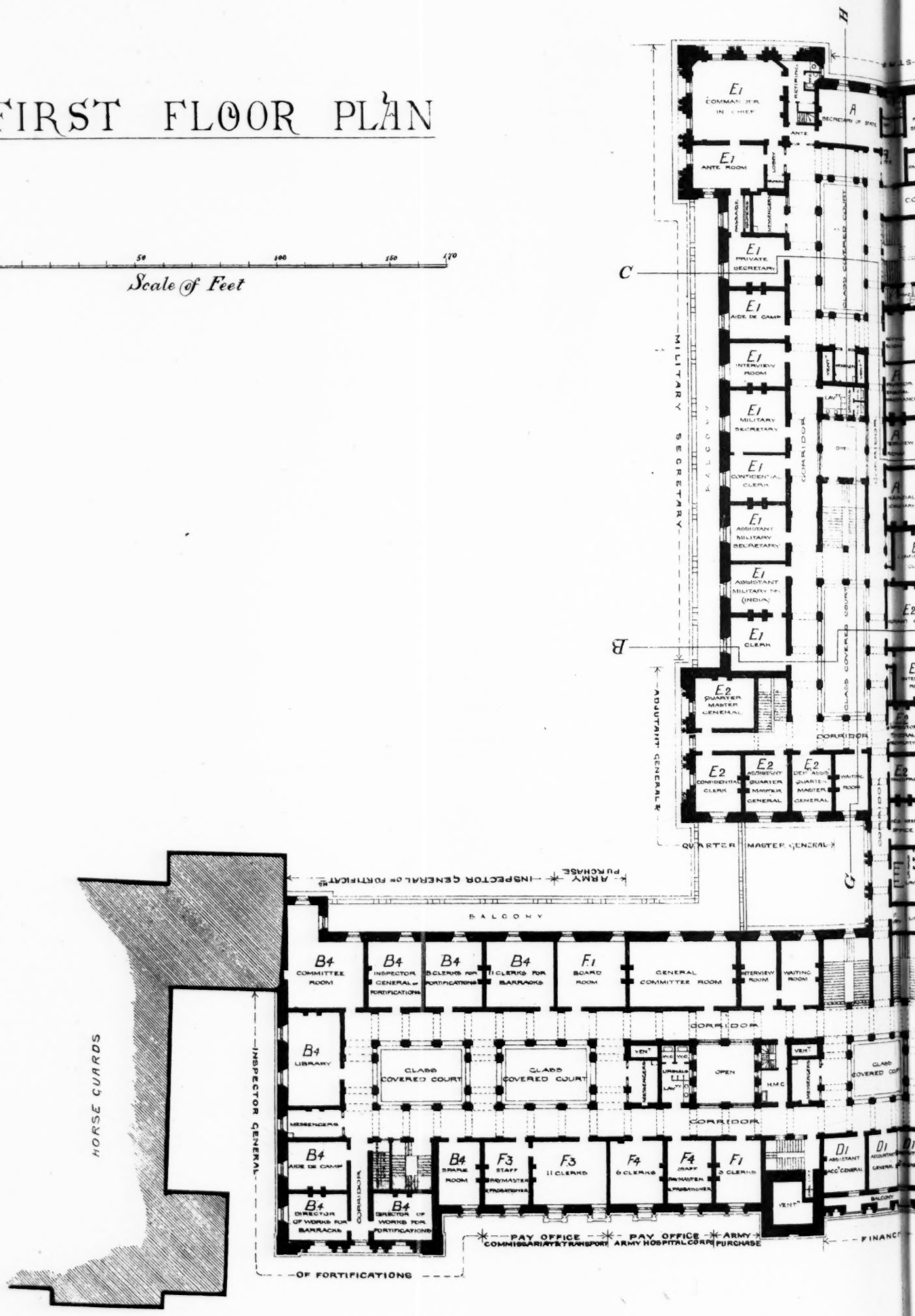
Scale 0 1 2 3 4 5 Feet

8 Castle St Holborn London E C

# FIRST FLOOR PLAN

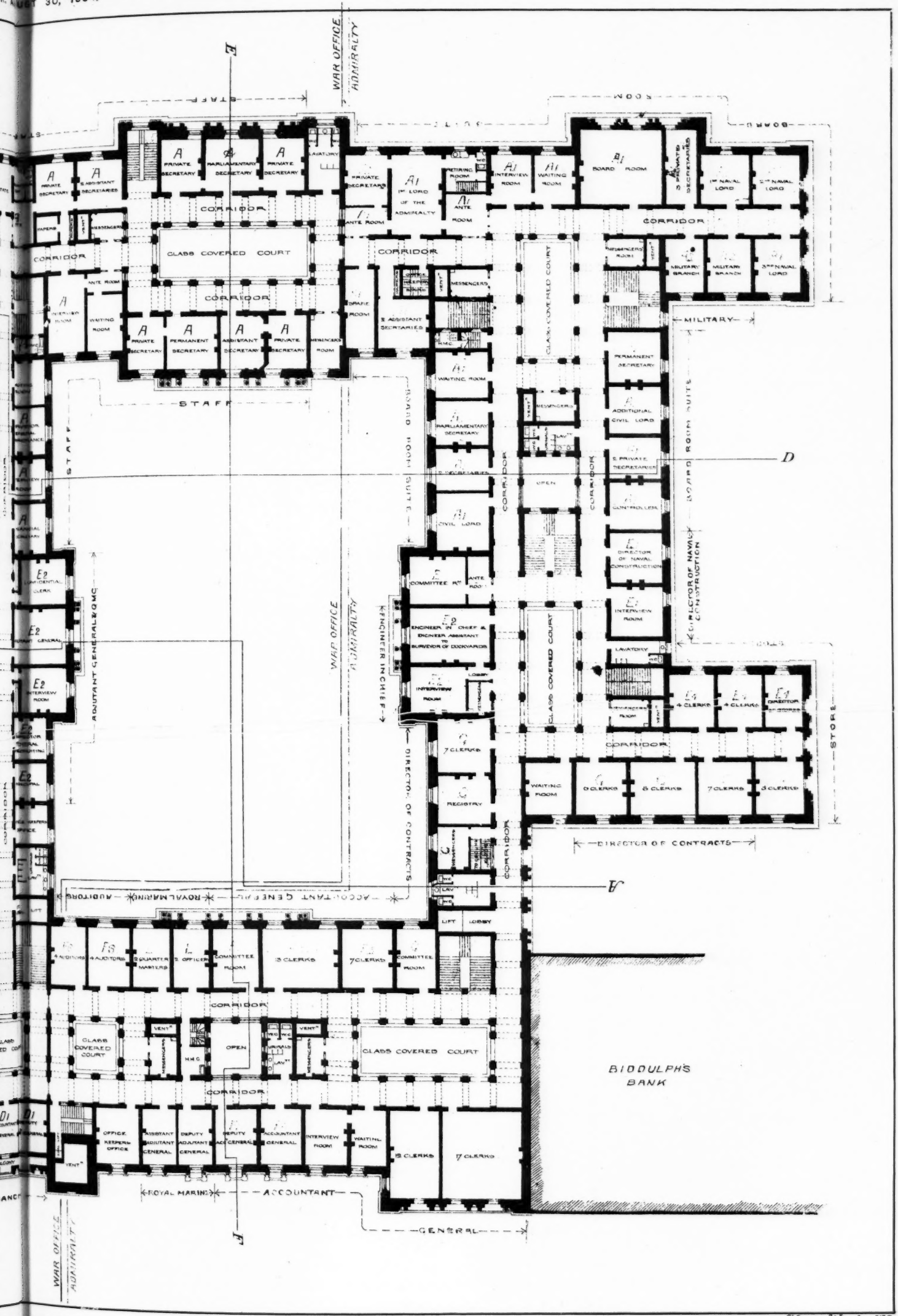



*Scale of Feet*




Wyman & Sons, Photo-Litho

PROPOSED NEW ADMIRALTY AND WAR OFFICE.—DESIGN SUBMITTED




TED I FIRST COMPETITION, BY MESSRS. I'ANSON & SON, AND F. T. BAGGALLAY.

C. Queen St. London. WC

"INK-PHOTO" SPRAGUE & Co., LONDON.

VIEW IN CENTRAL HALL.

## LEEDS MUNICIPAL OFFICES, Mr. GEO. CORSON, ARCHITECT.

*From Photographs by Mr. E. Wormald, Leeds.*

## Illustrations.

### DESIGN FOR WAR OFFICES: BY MESSRS. I'ANSON & SON AND F. T. BAGGALLAY.

WE publish this week another of the designs submitted in the Preliminary Competition for this important building; the elevation shows the Whitehall front, and to this is added a perspective sketch by Mr. Baggallay showing the grouping towards the Park. We may take the opportunity of saying that in other cases in which the authors of designs in the first competition wish for the publication of their drawings, we shall be glad to publish also a perspective drawing of the design if the authors like to furnish it, so as to put them on more even ground for comparison with the nine selected designs, the illustration of which we shall commence next week, and which will all be shown in perspective.

The present design has, as we think all our readers will agree, points of very great merit in the architectural treatment: the angles are powerfully accentuated, and contrast finely with the more elegant treatment of the intermediate spaces; and in these again the treatment of the four stories is very well contrasted, and a very picturesque effect is given by the continuous range of small columns and arcaded windows beneath the cornice.

We give the following extracts from the architects' report, which will serve to explain their own intentions in their own words:—

"The authors have adopted the Italian style, freely treated, as being best adapted to a public building. They have found from their large experience that it gives the greatest amount of light to the rooms and corridors, is easy of construction, and it will certainly be more in harmony with the National Buildings in the immediate neighbourhood than any other style. The treatment is simple, but they believe it will be effective, and they have carefully avoided useless ornament as being costly and unsuitable to the atmosphere of London.

On the south and west side overlooking the Horse Guards Parade an arcade is introduced so as to give increased grandeur to the building, and also to afford facilities for viewing the troops on holiday or state occasions. As will be seen by the drawings, this arcade forms no structural part of the building, and might be, if deemed desirable, entirely omitted, and a terrace only formed on the ground-floor level.

The authors have grouped the buildings round one large quadrangle, which, in their opinion, is a nobler and more convenient form of treatment than several small courts, and gives the maximum of light and air.

Private staircases and entrances have been provided for the Commander-in-Chief, the Secretary of State for War, and the First Lord of the Admiralty.

The glass-covered courts, which are one of the chief features of this design, and by which the corridors are, to a large extent, lighted, are roofed over with glass at the level of the ceiling of the second floor. They will be found to form very handsome and striking features in the corridor, besides being excellent ventilating shafts and a means of distributing heat, as pointed out in the special clause on that subject.

The draughtsmen's offices are on the third floor, and by the arrangement of windows on that floor which we have adopted, each draughtsman will have a window to himself, a point to which special attention has been directed in the instructions.

It was proposed to face the whole of the buildings externally with grey Aberdeen granite up to the level of the plinth, and above that height with Portland stone, as these two stones have been found by long experience to stand the effects of the London atmosphere better than any others."

The plan is open to considerable objections in detail, and the desire for architectural dignity and uniformity seems to have led to the window-space being too contracted, and the windows being inconveniently placed in many of the rooms. The merit of the design is therefore architectural rather than practical. When, however, we compare this with one or two of the designs (considered purely as designs) which it has been thought proper to include among the "sacred nine," we may certainly question whether the doctrine of considering plan as everything, and design as nothing, may not be carried too far.

### SKETCHES AT PLACES VISITED BY THE ARCHITECTURAL ASSOCIATION.

Of the four small sketches at the top of the left-hand side, one shows a corner of Hengrave Hall, with its cupola-topped turret. These turrets occur at every corner, and larger editions flank the entrance. Last week we gave part of the oriel window over this entrance. To-day we give, in the right-hand corner, some of the very fine mantling from one of the Kytson tombs in Hengrave Church. It will be seen that the shield bears the same arms as that on the corbel to the oriel window mentioned above. Another of the four small sketches shows a group of cottages at Melford, typical of the old-fashioned Suffolk cottages. The two churches, Hawstead and Livermere, are also typical of the smaller churches of the neighbourhood. They have no aisles, only nave, chancel, tower, and porch. Hawstead was the church of the Drurys, and contains some of their monuments. There is also a fine late pulpit, of which we give one panel. Livermere was not visited by the excursionists *en masse*, but a small detachment went thither and to Troston on an off-day. Livermere contains several things worth seeing. The bench-ends are quaint: there is a good late pulpit, a handsome panelled font, a bold wood roof to the porch, and a remarkable wood cornice to the chancel roof, in which Renaissance shields are enclosed in Gothic tracery. Troston, of which we give a measured drawing of the porch, is another small church. It contains some wall-paintings inside, but the south porch is its most notable feature, and is a very good specimen of the flush-panelled flint work of the district. Another specimen of this distinctive work is given in the clearstory of Woolpit Church. Here we have not only the flint panelling, but the chequerwork which is to be frequently seen, and which is particularly effective. It will be observed that the patterns of the panelling necessitate often very much cutting of the flints, and in many cases the flints have fallen out from the minute intersections of the stone lines. Last week we gave other examples of flint panelling from Fornham All Saints and Wetherden Church. From the latter to-day we give a bit of mantling from the Sulyard tomb (see right-hand top corner). Another sketch shows the entrance to Rushbrooke Hall. The porch forms the middle stroke of the E which represents the plan of the hall. It is the only portion which has any detail to speak of. We gave last week a view of the end of the top stroke of the E, and a bit of the railing round the moat. From Coldham Hall we give to-day two scraps of detail, which may be said to exhaust all there is. The remaining sketch shows part of the tracery of the Spring pew at Lavenham.

### LEEDS MUNICIPAL OFFICES.

We give this week two more interior views of this important new building. One shows the office staircase (see plan in our last number), in which the stairs are constructed with wrought-iron beams and joists filled in with concrete, and finished with cast-iron risers and treads laid with tile tesseræ. The stair parapet is of Hopton Wood stone, and the walls are lined with tiles to a certain height. The soffits of the stairs are finished in plaster.

The other illustration shows the Central Hall, the walls of which are built of Caen stone, and the pillars are of Devonshire marble.

### NEWCASTLE-ON-TYNE:

#### NEW PUBLIC BUILDINGS, DOCKS, ETC.

Newcastle-on-Tyne was *en fête* last week, on the occasion of the visit of the Prince and Princess of Wales, who, on the 20th inst., opened the Jesmond Dene portion of the Armstrong Park,—which is, for the greater part, the gift of Sir William Armstrong to the Corporation. It is mainly situated on the north-eastern slopes of the narrow valley through which runs the Ouse Burn. The tract of land is two miles in length, and as its entire superficial extent, including that of Sir William Armstrong's latest gift, is only about 104 acres, the fact that it is but a long and very narrow belt stands confessed. But (according to the *Newcastle Chronicle*, to which journal we are indebted for these particulars) so richly is it wooded, and so thoroughly hidden are its boundaries, that its real limits are never visible, and it appears to be many times its actual size. The park is in three sections, the limits of which are marked by intersecting public roads. The first section is the Heaton Hall Estate, of 22½ acres, acquired from Mr. Addison Potter for 12,562*l.*, in March, 1878. The second is Sir William Armstrong's first gift of land to the public parks, namely, 26 acres of the Jesmond Estate. This section is contiguous to the first, and comprises the narrow slopes between the Heaton Hall ground and the old Benton-road. The third and last section is made up of Sir William Armstrong's second and most valuable gift to the city, namely, about 54 acres of land on his High Jesmond Estate, presented by the donor in February, 1883.

*The New Museum.*

On the same day the Prince opened the new Museum. The old Museum of the Natural History Society of Northumberland and Durham was for many years an educational centre of the utmost importance to the locality; but, being entirely built-in on all sides, only a very small portion of the erection was visible from any point of view, and the main entrance was at the extremity of a narrow lane. The members were, many years ago, keenly alive to the unsuitable nature of their building; but the difficulties attending upon a change of quarters were very serious, and it was not until the early months of 1879, when the site known as St. James's came into the market, that decisive steps could be taken for the erection of a new Museum. The site in question is a triangular piece of land occupying the space between the North Road, on the eastward, and the old Moor road on the opposite side. The apex of the triangle points towards the Barras Bridge, and the base is marked by a boundary wall which separates the ground from that occupied by the Virgin Mary Hospital for Freemen. When the question of buying the land first arose, an old house, with an ivy-covered terrace in front, stood upon the spot. The ground was, in Mediæval times, a portion of the site of the ancient hospital for lepers, and a few scattered remains of that building have been discovered in the course of the recent operations. These relics include portions of the mouldings of an arch, showing dog's-tooth ornamentation, and they have been carefully put together and placed in front of the new structure. The price asked for the site was 6,000*l.*, and this sum was given for the purchase of it in October, 1879, by the late Colonel John Joicey. But the tenure of the land was only leasehold with right of renewal, and it was resolved to get it enfranchised. The cost of this procedure was 2,000*l.* additional, and Colonel Joicey also contributed that amount. Thus the site was acquired before the Christmas of 1879, and no time was lost in procuring designs for the building. The architects employed were Messrs. J. Wardle & Son, of Ridley-place, and the plans were supervised by Mr. John Hancock and other gentlemen interested in the affairs of the society. The interior of the structure is laid out in three large transverse apartments, which are lighted from the top, and surrounded by a system of corridors. These latter also give admission to rooms for the curator, for the committee, and for classes, and flights of stairs lead from them to the galleries which run round each of the apartments. The rooms are each 104 ft. in length, but the central one is 50 ft. in breadth, and the first and third ones are each 40 ft. 6 in. broad. The cost of the entire structure, with its internal fittings, was a trifle over 40,000*l.* The contractors for the fabric were Messrs. E. B. Reed & Son, of Newcastle, and this firm also supplied part of the fittings; but the greater portion of the work of furnishing and fitting up the interior was executed by Messrs. Robson & Sons, of Northumberland-street and Spital Tongues, and Messrs. Sopwith & Co., of Northumberland-street and Sandyford-road.

*The Reference Library.*

After leaving the Museum, the royal visitors proceeded to the Public Library, where they opened the new Reference Library, the contents of which, relating to every branch of art and science, are detailed in the *Chronicle*, only to make us regret the more the supineness of our great and wealthy metropolis in leaving whole districts as large or larger than Newcastle without such valuable aids to progress. The new Reference Library threatening to interfere with the Carliol Tower, as to the proposed removal of which there was much opposition, the Lords of the Treasury sent down as Commissioner Mr. E. J. Smith, who, after holding a public inquiry on the 18th of April, 1879, made his report to their Lordships, who shortly afterwards advised the Town Council that the application for borrowing powers had been acceded to. They (the Lords of the Treasury)

considered that the retention or the removal of the Carliol Tower was a purely local question, and that after an inquiry on the ground by Mr. Smith, one of their Commissioners, their lordships saw no grounds for interference. In February, 1880, a contract was entered into with the late Mr. George Bailey, for the erection of a new building from the designs of Mr. A. M. Fowler, leaving out the Carliol Tower, which was removed on the 20th of May, 1880, "to make way for a building more in keeping with the progress of the times." The Carliol Tower, although it occupied the site of one of the old towers of the town wall which surrounded that part of Newcastle, preserved in itself no vestiges of antiquity, as it had been entirely restored from the foundation almost within the century. It was declared by no less an antiquary than Dr. Bruce unworthy of retention. In the meantime, the lecture-hall of the Mechanics' Institute was arranged as a provisional lending library, and the educational work of the institution was continued in the upper rooms of the building.

*The Albert Edward Dock at Coble Dene.*

The Coble Dene Dock, opened by the Prince of Wales on the 21st inst., is the latest of the many improvements so energetically carried out by the Tyne Commissioners. Coble Dene Dock, situated a little to the west of North Shields, comprises in extent 26¾ acres, and will be mainly used for the accommodation of the import trade. After the Act was obtained for the construction of Coble Dene Dock, and before commencing the working drawings, extensive borings were made, which resulted in a resolution to change the position of the entrance. It was begun further inland than was at first contemplated, which had the effect of increasing the outer basin. The working drawings, prepared by Mr. P. J. Messent, Engineer to the Commissioners, and approved by the late Mr. J. F. Ure, their former engineer, were completed in May, 1874. The delay was occasioned in consequence of the alterations made by the borings. Shortly afterwards the works were commenced by the Commissioners' own men, and they went on rapidly until they were delayed by the failure to obtain the Act for additional powers in 1876. The second application in 1877 was successful, and the work was resumed with activity. Last year operations were so far completed that the water was let into the lock. The gates and sluices of the lock were then used for admitting and letting out the hoppers attending the dredgers which were employed in further completing the deepening of the dock. The length of quay and dock is about 3,000 ft. A new river wall about 1,500 ft. long can be used as a quay from the river. The total excavations, a large portion of which has been done by the dredgers and steam navvies, comprise 2,620,000 cubic yards. The total quantity of granite used in the entrances, quays, walls, and other erections is 343,732 cubic yards, the granite and other ashlar used at the entrance-steps and coping being 355,000 cubic feet. The greenheart used in the construction of the gates amounts to 36,600 cubic feet. The tidal entrance is 80 ft. wide, and the lock 60 ft. wide, each having gates to it made of greenheart. The depth on the sills of the tidal entrance and the upper end of the lock is 15 ft. at low water, and 30 ft. at high-water spring tides. The depth on the lower sill of the lock is 21 ft. at low water, and 36 ft. at high water, so as to enable vessels to be locked from and to the river at low-water spring tides. The length of the lock between the gates is 350 ft. Grooves are made outside the gates for caissons, by which the length of lock may be increased to 400 ft., or more if necessary. The whole of the work has been done by the Commissioners' workmen, without contractors, including the heavy gates of greenheart, which were constructed at the Commissioners' works at Howdon yard. The hydraulic machinery in connexion with the gates and other appliances are the manufacture of Sir William Armstrong & Co. At the north end of the dock there is a coal-shipping staith of sufficient length to tide a vessel 400 ft., and on each side two vessels of 250 ft. long. The staith is provided with four spouts on each side, and extensive standage ground connected with the North-Eastern Railway and the Northumberland collieries. Mr. Messent has patented an apparatus for shipping coals without breakage, and it will be applied to one of these spouts.

## OBITUARY.

*Mr. Thomas Wisedell.*—The *New York Times* announces the death, on the 31st ult., of Mr. Thomas Wisedell, of whom it speaks as "the leading theatrical architect of this city, and for his age one of the foremost architects of this country." Mr. Wisedell was born in London, in September, 1846, and early in life he became a pupil of Mr. Robert J. Withers. While still with Mr. Withers he attracted the attention of Mr. Vaux, of the firm of Vaux & Withers, of New York (the latter of whom is a brother of the London architect), who was on a visit to England, and was by him induced to go to America. That was in 1868. For many years thereafter he was a valued assistant to Vaux & Withers, and in 1879 he became a member of the firm of Kimball & Wisedell. For the past eight or ten years he has, under the direction of Mr. Frederick Law Olmstead, designed the architectural features of the improvements of the Capitol grounds at Washington. In connexion with Mr. Kimball, he has designed and built many well-known theatres in this and other cities. Among these are the Madison-square Theatre, Harrigan & Hart's Theatre, and the Casino, at Broadway and Thirty-ninth-street, in New York; the Springfield Opera House, at Springfield, Mass., and the Yonkers Opera House, which was opened last spring.

*M. de Nittis*, the well-known French painter, died almost suddenly on Saturday, of a chest disease, at the early age of thirty-nine. M. de Nittis was born at Barletta, near Naples, but went whilst very young to France, and was essentially a Parisian.

*The Marquis de Mesgrigny.* — The *Athenæum* announces the death, at the age of forty-eight years, of M. le Marquis de Mesgrigny, the painter of French river scenery.

*Dr. Moritz Thausing.*—The *Academy* reports the death of Dr. Moritz Thausing, who had been in ill-health for some time past. He was keeper of the Albertina Collection at Vienna and professor in the university of the same city. The work by which he will be known is his "Life of Albert Dürer," first published in 1876, of which a second edition appeared only a few months ago. An English translation was issued by Mr. John Murray in 1882, under the editorship of Mr. Frederick A. Eaton.

*M. Leonard Lugardon*, the *doyen* of Geneva painters, has just died at the age of eighty-three.

## COMPETITIONS.

*New Municipal Buildings, Burnley.* — Mr. Waterhouse, A.R.A., having been elected by the architects competing for these new buildings to award the three premiums due, according to the conditions, to the authors of the three designs judged most worthy, reports that, after carefully examining each of the designs, with the aid of Mr. Windsor, the surveyor, he is induced to recommend the design of Mr. Henry Holtom, of Dewsbury, for the premium of 200 guineas; that of Mr. George Corson, of Leeds, for the 100 guinea premium; and that of Messrs. G. Nattress and F. G. Coward, of London, for the 50 guinea premium. Mr. Waterhouse adds that, in making these awards, he endeavoured to consider the compliance of the various designs to the instructions:—their artistic excellence,—convenience of plan,—constructive skill shown in each design,—the way in which the difficulties of the site had been overcome,—and lastly, their comparative cost. Though nearly all the competitors thought their designs could be realised for the sum at their disposal, it is clear that some of them would be far less costly than others. The artistic treatment of some of the elevations he regards as far above the usual average, though they were unfortunately not always accompanied by the best plans. The success of the competition is, he thinks, largely due to the evident fairness with which its conditions have been prepared.

*School of Science and Art, Lincoln.*—A new school of science and art is proposed to be erected here, at a cost of 7,000*l.*, that amount having been raised by private subscriptions in this place. It is to be built on land given by the city, worth about 1,000*l.* Designs having been invited in competition for three premiums, viz., 100*l.*, 50*l.*, 25*l.*, sixty-five designs have been sent in, and the building committee have requested Mr. Charles Barry to act as their adviser in making a selection of the three best.

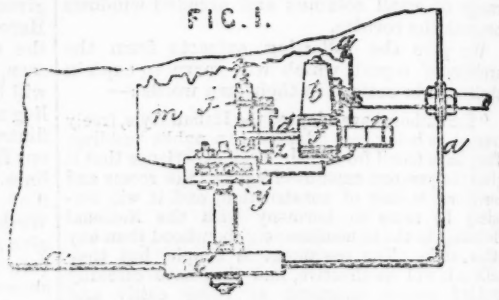
*Cheshunt Drainage.*—The Cheshunt Local Board have awarded the premium for the best scheme for the sewering of their town to Messrs. Gotto & Beesley; and a further premium to Messrs. W. P. Orchard & E. van Putten for the second best. There were twenty-six sets of plans submitted.

## ILLUSTRATIONS OF RECENT PATENTS.

5,727, Improvements in Apparatus for Measuring Water and other Liquids. William H. Tooth.

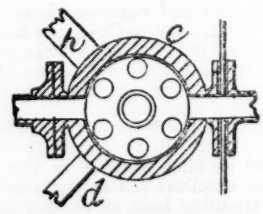
The important question of the measuring of water supplied to the household is dealt with by this invention, which offers a mechanical solution of the problem by an improved water-meter. The chief advantages claimed by the inventor are accuracy and simplicity of construction, the meter not being liable to get out of order. A chamber, tank, or cylinder is fitted with two valves, one at top and one at bottom, and having weighted levers connected together by a vertical rod on which a tube carrying a float slides freely. The plug of either of the valves is connected to a ratchet mechanism operating an index. The connecting-rod of the valves is screwed up with set screws or nuts to the proper position for registering the quantity of water

FIG. 1.




which is allowed to pass the cistern at each operation. The upper valve is the inlet, and the lower one the outlet, valve. A plan of the apparatus is given (fig. 1), shown as fitted to a cistern or tank. A front elevation, with the ratchet mechanism removed, is given at fig. 2, the side elevation of the same being shown by fig. 3. Fig. 4 is a perspective view, showing the meter attached to an ordinary supply cistern. Detached views of parts are given, figs. 5 and 6, and a section of the valve is represented by fig. 7. In the drawings all the letters

FIG. 7.




refer to similar parts in each figure; *a* is the vessel, and *b* the inlet valve, *c* is the outlet valve at the bottom of the chamber or tank. The levers, *f* and *g*, weighted by *h* and *i*, are connected by a vertical rod, *j*. A tube, *l*, slides on the rod, and carries a float, *m*. The weights, *n* and *o*, at the end, are to counterbalance the weight of the rod *j*. The lever of the lower valve, *c*, is fixed upon the spindle, *p*, but the lever of the upper valve works freely on the spindle, *q*, and is provided with an escapement, shown in figs. 5 and 6, for preventing the inlet valve from opening before the outlet valve is closed, and *vice versâ*. The rising and falling of the float, *m*, strikes on *u*, the pallets of the escapements, and operating a ratchet and pawl from an arm, *z*, on the valve lever, *a*, serves to actuate the indexes on the dials *e*. The meter being fixed to any reservoir of which the capacity is known, the inlet valve, *b*, is connected with the water main. The chamber being empty, the outlet being closed, and the inlet open, water from the main will pass into the chamber *a* of the meter through the inlet valve. As the level of the water rises, the float *m* will be raised, and when the chamber is nearly full, or the given quantity of water has been admitted thereto, the tube *l* of the float presses on the under-side of the regulating nut, and raises the rod *j*. The lever *d* is then oscillated, and when the vertical portion *h* makes an angle of about 22 degrees, the slot *x* will have moved over the end of the lower lever and the float *m* will raise the lever, and open the valve *c*, the weights will fall, and while the lower outlet valve is thus opened, the upper valve will be closed, and by the mechanical arrangement of tappets and spindles (as shown in the section, fig. 1), the pallets of the escapement are lifted, and the index hand is moved as the measured quantity of water runs off

FIG. 2.

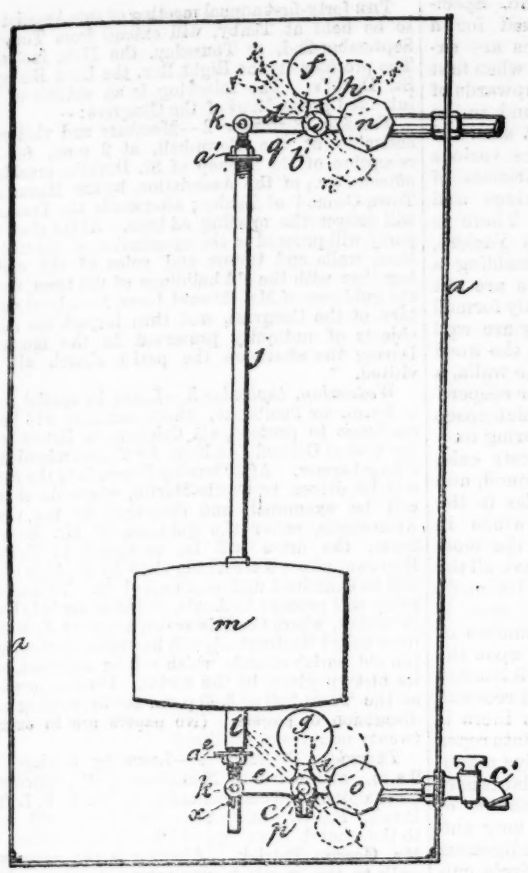


FIG. 3.

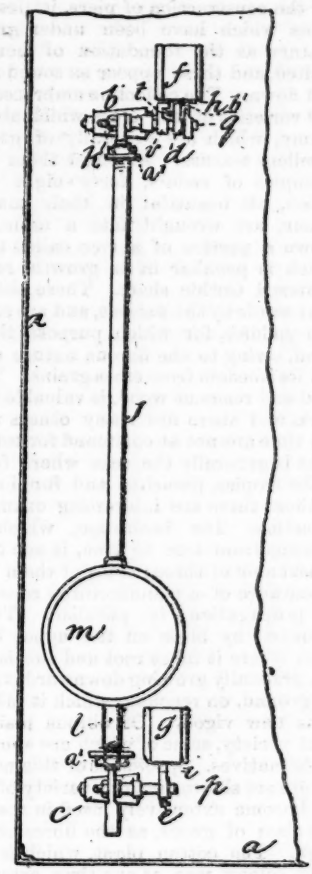


FIG. 4.

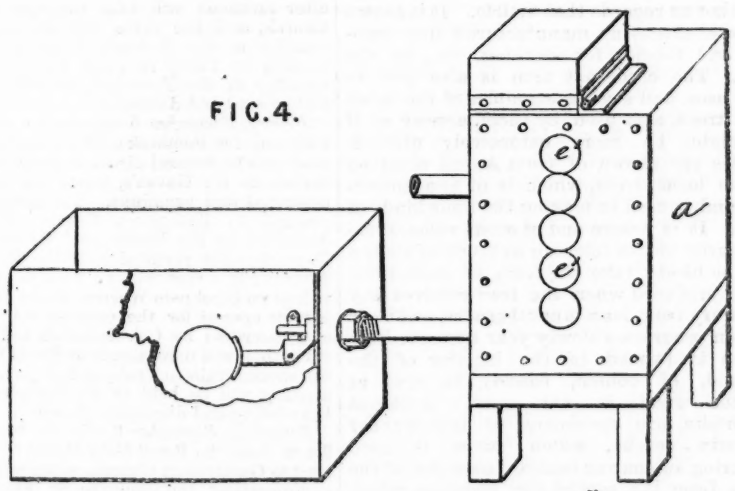


FIG. 5.

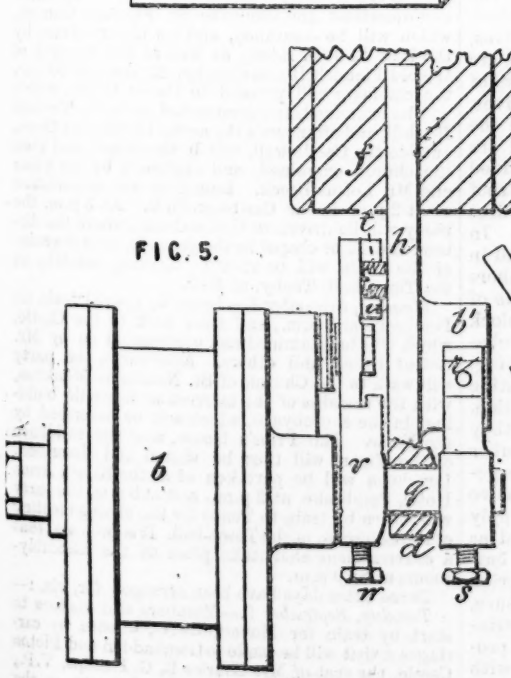
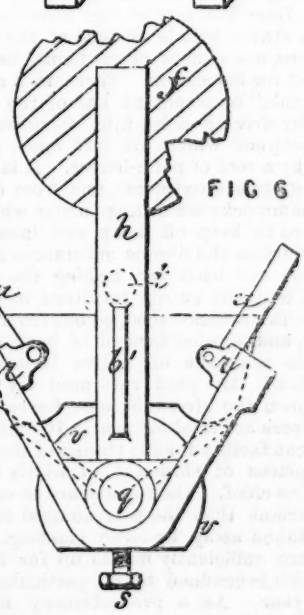


FIG 6



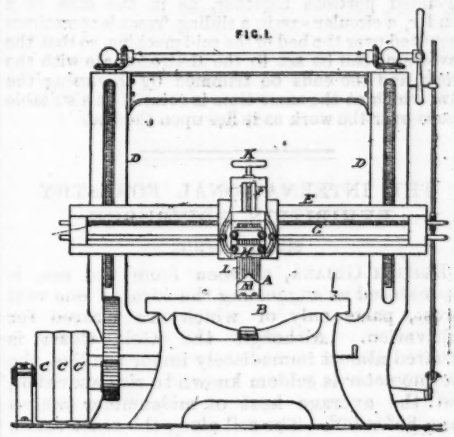
*Tooth's Patent Apparatus for Measuring Liquids.*

at the outlet valve, c, into a supply cistern, or is drawn off, as in figures 1, 2, and 3. The action of the escapement affords a certain measurement as the arm *z*, each time that the lever *d* is raised, rotates the ratchet to the extent of one tooth, and the amount of water which has passed through the chamber *a* is indicated on the dial *e*¹, each division of the index showing the quantity of water which has been allowed to flow into the cistern at each operation.

5,821, Improved Process for Working Marble and Stone. George Murray Morgan.

The methods usually employed in the manipulation of stone and marble for building and decorative trades are by manual labour with the primitive hammer and chisel. In this invention machinery is brought to aid in the sawing, moulding, or carving of stone or marble. The elevations and details are given in our illustrations, which will make the method perfectly clear. The marble to be worked is fixed by wedges, by cement, or by a box (A, fig. 1),

FIG. 1.



upon a travelling-table, B, which moves backwards and forwards by reversing gear. This traversing movement is automatic, and arranged so that on the termination of the forward and backward travel of the table B the strap is automatically shifted from one pulley to another, and the motion of the table reversed. Over this traversing table are fixed vertical side frames, D D, carrying the traversing tool-box slide, E, upon which one or more tool-boxes, F, rest, and which are capable of transverse adjustment to any required position by means of the leading-screw, G. A tool-rest, H, upon this tool-box, F, is fitted with the usual vertical movement, controlled by the screw, K, and in this tool-rest the multiple roughing-tool (figs. 2 and 3), or the finishing-tools shown in figs. 4 and 5, are fitted by

FIG. 2.

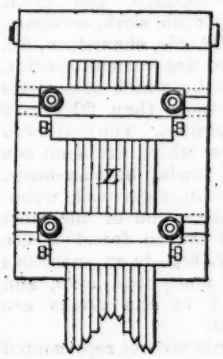


FIG. 3.

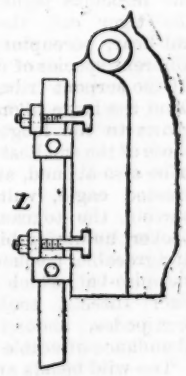
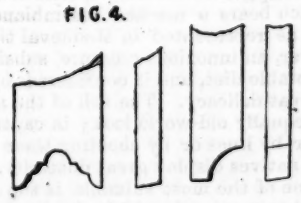


FIG. 5.

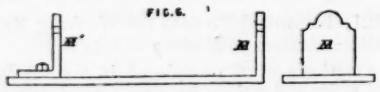
FIG. 4.



clamps and nuts. The traversing table under the fixed tool-rest carrying the cutting-tools is utilised to cut the moulding upon the surface of the marble or stone to any required shape. Several tool-boxes may be fitted upon the transverse tool-box slide E, and several different pieces of marble or stone may be cut and moulded simultaneously. In roughing out marble or stone, a multiple series of tools *h* (fig. 2), ground to diamond or angular points, are used. From the brittle nature of the material, a pointed tool effects the removal of the rough material with the least possible amount of cutting labour, and consequently most expeditiously. The tools are of considerable length; and with their cutting-edges kept comparatively

close to the tool-rest, in order to render them very rigid, and they are ground with a cutting-edge at a somewhat more acute angle than that generally used for cutting cast iron. A finishing tool is shown in fig. 4, and a right and left handed tool for each half moulding alternatively adopted is also shown in fig. 5. To avoid chipping at the end of the piece of marble or stone a cast-iron open three-sided box, with its end M-shaped to the form of the moulding is used (fig. 6). One end (M') is adjustable upon

FIG. 6.




the end of the box, so that when the piece of marble is embedded in the box, the movable end is brought close up to the end of the marble or stone moulding, and securely bolted there in position. The strip of marble or stone moulding is thus supported at its ends by the ends of the cast-iron box, and is, consequently, prevented from chipping. To fit the moulded portions together, as in the case of a fender, a circular saw in a sliding-frame is sometimes mounted over the bed of the said machine, so that the saw-frame can be set to the desired angle with the work, and the ends be trimmed by traversing the saw, which at the same time is rotated at a suitable speed over the work as it lies upon the bed.

## THE INTERNATIONAL FORESTRY EXHIBITION, EDINBURGH.

### SIXTH NOTICE.

British Guiana, as seen from the sea, is represented as suggesting the idea of one vast forest, parts only of which are cleared for cultivation. Although the Gold Coast is situated almost immediately under the line, the thermometer is seldom known to rise above 93°, and the average heat of midsummer ranges from 85° to 90°. The soil along the coast varies from a light sandy or gravelly nature to a fine black mould and loamy clay, and beyond are seen the highlands crowned with lofty trees and thick underwood. Advancing from the shore it is found that as we proceed the richness of the soil increases, and when a distance of six or eight miles is reached, it seems fit for any species of cultivation. Fruits in infinite variety abound, and many of the trees grow to a height of 100 ft.; they consist of almost every variety of such as are valuable for hardness and durability, as well as of others which are richly veined, capable of taking the finest polish, and well adapted for all sorts of ornamental furniture, while others yield valuable dyes or exude balsamic and medicinal oils. Wild animals and beasts of prey are abundant. These comprise the ferocious jaguar, the congar or red tiger, the tiger cat, the crabbodago, the great ant-bear, porcupine, armadillo, sloth, opossum, different species of deer, lizards, chameleon, &c. Of the serpent tribe there are various species, from the large aboma snake, which sometimes grows to the length of more than 20 ft., to those of the smallest description. The feathered tribe also abound, amongst which are seen the crested eagle, vultures, owls, butcher-birds, parrots, the toucan, pelican, tiger-bird, woodpecker, humming-birds, &c. One of tne most disagreeable frequenters of the forest is the vampire-bat, which grows here to an enormous size. Insects, such as mosquitos, ants, and centipedes, abound, and in the rivers are abundance of edible fishes.

The wild beasts and birds are not represented in the exhibition, but there are examples of the reptilia, including an interesting specimen of the iguana, which bears a marked resemblance to the dragon as represented in Mediæval times; it is, however, an innoxious creature, subsisting upon a vegetable diet, and is considered by the natives a great delicacy. The fish of the rivers present an equally old-world look; in capturing them, either by lines or by shooting them with arrows, the natives display great dexterity. Of the trees, one of the most valuable is the *Mora gigantica*, the wood of which is hard and resembles teak. The tree sometimes attains the height of 300 ft., and a girth of 18 ft. It was at one time extensively used in this country for shipbuilding purposes, but since iron has come to be so much used for that purpose the demand for it has fallen off; still it is found to be well suited for railway sleepers, for which purpose it has been used in Demerara, Barbados, and Trinidad, where, from the bitter principle which it contains, it is found free from the attacks of insects.

In Georgetown this wood fetches about ¼d. per cubic foot. Another wood possessing the quality of resisting insect attacks is that known as the Greenheart. It has a specific gravity of 75 lb. to the cubic foot, and is most valuable for the construction of piers, jetties, &c. Specimens which have been under ground for a century as the foundation of houses are exhibited, and these appear as sound as when first laid down. The collection embraces upwards of 100 varieties of the trees which abound in the colony, which are generally of good size and excellent texture. Amongst them are various examples of cedars, forty-eight varieties of which, all beautiful in their markings and colour, are wrought into a table. There is shown a portion of a tree called the Yarioro, which is peculiar in its growth, resembling a clustered Gothic shaft. These shafts are cut downwards by the natives, and are easily formed into paddles, for which purpose they are well fitted, owing to the fibrous nature of the wood and its freedom from cross grains. The walla, a hard and resinous wood, is valuable for coopers' work, and there are many others which space and time are not at command for referring to.

As is generally the case where forests exist in the tropics, parasites and fungi abound, and of these there are interesting examples in the collection. The bush-rope, which winds in festoons from tree to tree, is one of the most remarkable of these; some of them have all the appearance of a manufactured rope. Its mode of propagation is peculiar. The seed is deposited by birds on the upper branches of trees, where it takes root and subsists upon the sap, gradually growing downwards till it reaches the ground, on reaching which it takes root and gains new vigour. Of fibrous plants there is great variety, some of which are spun into ropes by the natives. Specimens of this native manufacture are shown, and this variety of plants may yet become extensively used in the making of that class of goods, as the fibres are long and tough. The cotton plant, which is indigenous to the colony, was, at one time, extensively cultivated, and formed a staple industry of the country; but America has now the chief hold of the market as regards that article. It is shown in different stages as manufactured into hammocks and fabrics for clothing, &c., by the natives. The cocoa-nut tree is also put to various uses, and several examples of the inner bark of trees, also used by them, appear as if they might be more extensively utilised. Examples are shown of Gum Animi obtained from the locust-trees, which is of fine amber-colour, and is used in making the finer kinds of varnish. It is scarce and of great value, some of the purer blocks fetching as much as 200*l.* a ton. The blocks take the form of stalactites, and are produced when the tree receives any slight injury from insects or otherwise, and their formation progresses slowly year by year. This secretion is formed in the interior of the tree, and, of course, cannot be got at until the wood is cut open. Amongst the exhibits are specimens of india-rubber and gutta-percha, which latter is used for covering submarine cables. Samples of the Cassava from the root of the Mannioc, which forms a staple article of food of the natives, and a large assortment of medicinal barks, are submitted for inspection. There is a model of the "banab," or woodland hut of the natives, formed by driving poles into the ground, the spaces between which are left open, and are covered by a roof of palm-leaves. It is divided within into two apartments, and from the roof rafters hammocks are swung, under which fires are lighted to keep off damp and insects. In its construction the fibrous substances found in the woods are used for lashing the timbers together, and the scanty furniture is made of wicker-work. A canoe scooped out from a block of cedar, and another formed of bark, are characteristic examples of native boat-building. A model of the punt raft used for floating timber down the rivers is sent for exhibition. As the rivers are tidal for nearly 100 miles they afford great facility for the transit of the timber to the places of shipment, of which Georgetown is the chief. The forests are so extensive and luxuriant that there is no need to supply what is taken away by fresh planting, and as yet nature sufficiently makes up for the outtake, which is confined to no particular period of the year. As a precautionary measure, however, Government has appointed superintendents to overlook the traffic, and it is proposed to establish a School of Forestry with the view of utilising the abundant products to the best advantage.

## BRITISH ARCHÆOLOGICAL ASSOCIATION.

The forty-first annual meeting of this Association, to be held at Tenby, will extend from Tuesday, September 2nd, to Thursday, the 11th, inclusive. The president is the Right Rev. the Lord Bishop of St. David's. The following is an outline of the intended proceedings of the Congress:—

*Tuesday, September* 2.—Members and visitors to assemble at the Town-hall, at 2 p.m., for the reception of the Bishop of St. David's, president, officers, &c., of the Association, by the Mayor and Town Council of Tenby; afterwards the President will deliver the opening address. At its close the party will proceed to the examination of the ancient town walls and towers and ruins of the castle, together with the old buildings of the town, under the guidance of Mr. Edward Laws, hon. local secretary of the Congress, and then inspect the many objects of antiquity preserved in the museum. During the afternoon the parish church will be visited.

*Wednesday, September* 3.—Leave by special train at 9 a.m. for Pembroke, where carriages will be in readiness to proceed, viâ Orielton, to Brownslade, the seat of Colonel Lambton, for the examination of a long barrow. After leaving Brownslade the party will be driven to Castle-Martin, where the church will be examined, and described by the vicar. Afterwards, under the guidance of Mr. Edward Scott, the drive will be continued to Newton Burrows, where a cromlech, close by the high road, will be examined and commented on. Thence the party will proceed to Angle, and afterwards to Rhos Crowther, where the Edwardian house of Jestinton (now called Eastington), will be commented on, and the old parish church, which will be explained, and its history given by the rector. Evening meeting at the Town-hall at 8.30 p.m., for the reading and discussion of papers. (No papers are to exceed twenty minutes in reading.)

*Thursday, September* 4.—Leave by carriages at 9 a.m., and drive to Manorbere Castle, which will be examined and commented on by Mr. E. P. Loftus Brock, F.S.A., and then the party will walk to the church close by, which will be described by Mr. George Patrick. Afterwards the party will walk to the cromlech overlooking the bay, which will be described by Mr. Edward Laws. Thence the party will return to Manorbere Castle, and after luncheon will take carriages to Hodgeston Church, and the drive will be continued to the remains of the Bishop's Palace at Lamphey, returning to Tenby in good time for the evening meeting at the Town-hall, at 8·30, where papers will be read and discussed.

*Friday, September* 5.—Leave by special train at 9.30 a.m. for Pembroke, where carriages will be in readiness to proceed direct to the Stack Rocks and thence to St. Govan's, where the chapel will be described and examined. The carriages will then proceed to Bosherston Church, which will be described by the Rector, and thence to Stackpole Court, by the permission of the Earl of Cawdor. Afterwards a visit will be paid to the prehistoric village on Stackpole Warren, where the tumulus or barrow opened for the occasion will be examined and described by Col. Lambton and others. The party then will drive direct to Pembroke in time for the special train to Tenby at 6.30 p.m. An evening meeting will be held at the Town-hall at 8.30, for the reading and discussion of papers.

*Saturday, September* 6.—Leave by carriages at 9 a.m. from the Royal Gate House Hotel, and proceed to Gumfreston Church, which will be examined and described, and thence to St. Florence Church, which will be described, and its history given, by the Rev. E. J. S. Rudd, as well as the remains of the old Flemish House close by. At about 10·30 a.m. the carriages will proceed to Carew Castle, which will be examined, and commented on by Mr. Thomas Blashill, and afterwards the ancient interlaced Cross, outside the Castle wall, will be inspected, and then the church examined, and explained by the Vicar and Mr. Loftus Brock. Luncheon will be partaken of at 2 p.m. in the Castle-grounds. At 3 p.m. the party will be driven to Upton Castle, where the disused church or chapel in the grounds, near the ruins of the castle, will be visited. Evening meeting at the Town-hall, Tenby, at 8·30.

*Monday, September* 8.—Leave by special train for Pembroke at 9 a.m., and then walk to the Castle, which will be examined and commented on by Mr. Loftus Brock and others. Afterwards, the party will walk to the Church of St. Nicolas at Monkton, with the remains of the interesting Monastic buildings in the churchyard, which will be described by the Vicar. The Prior's House, now the residence of the Vicar, will then be visited and described. Luncheon will be partaken of at the King's Arms Hotel, Pembroke, at 2 p.m., and at 3 p.m. the party will return by train to Tenby for the closing meeting of the Congress, at the Town-hall. It is proposed that a *conversazione* shall take place at the Assembly-rooms at 8·30 p.m.

Three extra days have been arranged for, viz.:—

*Tuesday, September* 9.—Members and visitors to start by train for Haverfordwest, whence by carriages a visit will be made to Glenhaddon and Picton Castle, the seat of Mr. Charles E. G. Phillips, V.P., taking any object of antiquarian interest on the road there.

*Wednesday, September* 10. — Leave the Castle Hotel by carriages, and drive to St. David's, taking certain antiquarian remains on the way, and halting at Roch Castle, and taking the tumulus at Pointz Castle. On reaching St. David's, luncheon will be partaken of at the Grove House Hotel and other inns, where accommodation will be arranged for the night. At 2 p.m. a visit will be made to the cathedral, where, under the guidance of the Dean of St. David's, an examination of some of its principal features will be made. After service, a furrher investigation will be made of the monuments, effigies, &c., and then a visit paid to the remains of Bishop Gower's Palace, &c.

*Thursday, September* 11.—Members and visitors to proceed after breakfast to St. David's Head, and there examine the stone circles, stone avenues, and cromlech, and other prehistoric monuments. Return to St. David's by the reputed site of the supposed Roman city of Menapia, and inspect the ruins of St. Justinian's Chapel on the seashore. Afterwards leave St. David's by carriages, and return to Haverfordwest, thus bringing the Forty-first Annual Congress of the Association to an end.

## MASTERS AND MEN.

*Scotch Masons.*—At general meetings of the operative masons of Edinburgh and Leith, held on Saturday afternoon, two delegates from Glasgow reported that the strike there was still continuing. They stated that three weeks ago 2,500 men came out for an advance of wages to 8d. per hour. Fifty-eight employers had agreed to pay the sum asked, and had employed 1,050 hands. Upwards of 1,000 had left the city, and had found employment throughout the country, and the strike roll was now reduced to 275.

*North Wales Slate Quarries.*—The men employed at the Maenoffen Slate quarries, one of the largest industries in North Wales, who struck work a fortnight ago against a reduction of 5 per cent. in wages, on the 22nd inst. resumed work upon the masters' terms. The slate trade in North Wales keeps very flat.

## AN ARCHITECT'S CLAIM FOR PROFESSIONAL SERVICES.

NORMAN *v.* THE LEZANT SCHOOL BOARD.

MR. GIFFARD, judge, on Monday last, gave his decision at the Stonehouse county court in the case of Mr. A. Norman, architect, *v.* The Lezant School Board.

Mr. Norman claimed 30*l.* 9s., which he made up as follows:—Surveying Kenna school-buildings and the master's house and reporting in what respects they were not in accordance with the specifications, 6*l.* 6s.; measuring the work in detail and making estimates of cost, conformably to the contract, 7*l.* 7s.; numerous attendances and correspondences as arbitrator, 12*l.* 12s.; umpire's fee, 2*l.* 2s.; expenses, 2*l.* 2s. The first item of 6*l.* 6s. and last of 2*l.* 2s. were paid into court, the defendants contending that this was all Mr. Norman was entitled to. It appears he was instructed to make a report on the buildings in question, and named as his price 6*l.* 6s. and expenses, which was accepted. Circumstances afterwards arose calling for further services on his part. He therefore claimed for further remuneration.

His Honour gave a verdict for the plaintiff with costs, and remarked that in his opinion there was nothing in the course Mr. Norman took inconsistent with his duty, and he was fairly entitled to remuneration for his time and labour.

## DISSENTING CHURCH-BUILDING NEWS.

*Chatham.*—The memorial-stones of a new Bible Christian Chapel and Hall in the Luton-road, Chatham, have been laid. The buildings consist of a chapel and hall with class-room, vestries, lavatories, &c. They are situated on a commanding corner site, the chapel having a square buttressed tower at the angle of the building, with turret on opposite side, large rose-window in centre of arched recess, and double-entrance porch, while the side elevation is divided into five bays with double windows and buttresses between. The elevation of hall is of similar design to side of chapel, to which it is joined by vestry buildings and choir and organ recess over. The style adopted is Early English, the materials being red bricks with white stone dressings and slated roofs. Mr. J. Kingwell Cole, of Mount-street, Grosvenor-square, is the architect, and Mr. C. E. Skinner, of Chatham, is the contractor.

*Forest-hill.*—The new Bible Christian Church of St. James, situated in the Stanstead-road, Forest-hill, was formally opened on the 1st inst. The church, with its spire, 120 ft. in height, is in the Early English style. It has a double entrance in the front. There is sitting accommodation for 500 persons. The organ, built by Mr. Hunter, of Clapham, is fixed in the chancel in the rear of the choir-stalls. In front is the rostrum, which is of stone. The contract price for the erection of the church and adjoining hall is 7,800*l.*; but the building of the hall will not be immediately proceeded with. The architects are Messrs. James Tolley & Son, of 66, Cannon-street; and the builders are Messrs. J. M. Macey & Sons, of Battersea. The gas-fitting work has been supplied by Mr. Dodson, of Fetter-lane; and the heating and cooling apparatus by the Æolus Water-spray and General Ventilating Company.

# The Student's Column.

## HINTS FOR THE STUDY OF THE HISTORY OF ARCHITECTURE.—IX.

THIRTEENTH-CENTURY GOTHIC.

WE have now taken note of the various styles that had come into existence previously to the development of the Pointed Gothic style, which reached its culminating perfection, in the opinion of the best authors, in the thirteenth century.

Rosengarten, with pardonable national prejudice, heads his chapter v. (page 287), as "The Pointed Style, called also the Gothic or German Style." We have seen, however, that the Germans developed and clung to a *round-arched* Gothic style, of which they may well be proud, and which they may well be content to call a German style. The Italians developed a Pointed Gothic style which has beauties of its own, and in some individual instances,—such as the Campanile at Florence, designed by Giotto in 1324 (see Fergusson, page 788; Rosengarten, page 361; Prof. Roger Smith's "Gothic and Renaissance," page 121),—their work is unrivalled; but they were half-hearted in their appreciation of the style. In Sicily there is some Gothic work, such as Palermo Cathedral, but as nearly all the styles of the known world met in that small island, they all exhibit a mixed character, highly interesting, but decidedly adulterated. Spain is now known, through Street's special work on the Gothic architecture of that country, to contain some very fine examples of this style. The north-east of Europe displays its local peculiarities, as at Lubeck. Norway has its Trondhjem Cathedral, Sweden its Upsala, Holland its Dordrecht, Belgium its Malines, and we in England have a series of buildings, which are certainly unsurpassed for quiet beauty and lovely proportion by any other Gothic work in the world; but it must be admitted that the main problems of the Pointed Gothic style were worked out in France, and that it spread from that country, more or less directly, into all the others that cared to adopt its principles.

Before describing the fully-developed style, it will be well to accompany Fergusson, who, starting on p. 293 of his Handbook, and from the time of Charlemagne, 768 to 813 A.D., goes steadily through the various districts of France, in which the several local peculiarities are distinctly recognisable. He begins with Provence at the south-east, where the Romanesque influence is strongly marked in such churches as Notre Dame des Doms at Avignon (mentioned in the former article on Romanesque), and which led to the Classic frieze-like result in the porches of St. Trophime at Arles. He proposes his theory that the pointed arch was introduced in order to reduce the weight over the apex of the continuous tunnel vaults, which were immediately covered with their external tiles, without an outer wooden roof; other authors attribute the introduction of the pointed arch to the Crusaders, who became acquainted with it in Syria in the twelfth century; but there can be no doubt that the real origin of the pointed arch was a constructional one, and that it arose in the first instance from the tendency of large round arches to sink at the crown. Thus in Furness and Kirkstall abbeys all the large arches of the nave arcade are pointed, though the small arches in the same buildings are round. Mr. Fergusson then takes the adjoining district of Aquitaine, which, as we have seen before, contains the remarkable Church of St. Front at Perigueux, copied from the Byzantine example of St. Mark's at Venice, except that the arches and domes are pointed; this he considers easier of construction than with round arches; whereas Scott, in his Academy Lectures, holds the contrary opinion. Thence follow other domed churches, but all on the plan of a Latin cross, instead of the Greek cross. [These churches are illustrated by Verneilh, in his "Architecture Byzantine en France," 1851, 1 vol. quarto.] He then mentions the typical Church of St. Sernin at Toulouse, and points out the aisle continued around the apse and chapels growing out of the aisle, which constitute a *chevet* as distinguished from the simple *apse*. He next takes the district of Anjou, north of the latter, in which we get the remarkable church at Loches, with its row of octagonal domes like squat spires, and the domed church at Fontevrault, where our Plantagenet kings, Henry II. and Richard I., were buried. Then he illustrates the Church of Notre Dame at Poitiers, the west front of which shows the local love for sculpture. Next he takes Auvergne,—a purely volcanic country, whose inhabitants long retained their original characteristics unchanged, and whose style of architecture is distinct, and early reached perfection. This district may be studied in an excellent paper by Street, illustrating the churches of Le Puy. It was also visited by members of the Architectural Association, under the direction of the late Mr. Sharpe, with the result of a finely-illustrated work on the subject. After remarking the Frankish style as exhibited by a church called the Basse Œuvre at Beauvais, not unlike a Roman basilica, he goes on to Normandy and treats of the difficulties of vaulting the nave of a church without having recourse to a pointed arch. Here the subject is brought home to us by the churches at Caen erected by William the Conqueror, who introduced the Norman style into England in 1066 A.D.

The next district, Burgundy, is remarkable for its abbey churches, that of Cluny, now destroyed, having been one of the largest in Europe, measuring 580 ft. in length. It was begun in 1089 by St. Hugues, and dedicated in 1131, and was lacking in the contrivances of groined vaulting, which provided clearstory windows, and must therefore have shared the upper darkness common to churches without such means of lighting. The church at Tournus has the peculiarity of a series of barrel vaults, at *right angles* to the direction of the nave, an example, perhaps, worth imitating for many reasons. At Autun the fluted Corinthian pilasters are rather startling, until we look about and find them accounted for as being inspired by old Roman work in the town. The church at Vezelay is remarkable for the progress in vaulting exhibited in the nave, and afterwards the porch or narthex required by the rules of the monastic order to which it belonged (no connexion with the Classic "orders").

Fergusson concludes his topographical arrangement with Frankish architecture, Frankia being the central province of which Paris is the head, and he then goes on to describe the features of those fully-developed cathedrals of which a surprising number were erected in the thirteenth century, including the end of the twelfth,—that is, from the revival of the national power, under the guidance of the great Abbé Suger, about the year 1144.

It should here be mentioned that England was again indebted to French influence in two more leading examples, at Canterbury Cathedral, from the design of William of Sens, in 1175, and at Westminster Abbey, where French arrangements are strongly marked in the portion built in 1269. We had, however, developed a style of our own, known as Early English (and not to be confused with the upholsterers' abominable misuse of that title), of which Salisbury Cathedral, built between 1220 and 1258, is a well-known example.

For those who can read French, no better author can be consulted than Viollet-le-Duc. His "Lectures" and his "Habitations of Man" have been translated into English; but not his finest, most exhaustive, and most practical work, "Dictionnaire raisonné de l'Architecture française du XI$^{e}$ au XVI$^{e}$ Siècle," or, rather, the translation has only been begun. In vol. i., under the word "Architecture," is a long essay from p. 116 to p. 452, which deals not only with the subject generally, but afterwards with the Ecclesiastical, Civil, and Military divisions of it in complete detail.

He demonstrates that the development of Pointed Gothic architecture is entirely a question of stone vaulting. At first continuous tunnel vaults were used over the nave, supported *at their springing* on each side by half tunnel vaults over the upper story of the side aisles, and he instances the Church of Notre Dame du Port, Clermont-Ferrand, in the south

of France. This church is also illustrated by Rosengarten on page 266, and shows how this arrangement precludes the introduction of light into the upper part of the nave. On account of this difficulty the naves of some churches had a *wooden roof* only above the level of a range of clearstory windows, as at the original church of St. Remy at Reims. The aisles of these churches were often covered with *groined* vaults (that is to say, the intersection of two vaults at right angles to each other) which admitted of windows being continued up to their apex; but the early builders were not able to construct a groined vault over the width of a nave. Moreover, such a vault is most easily applicable to a *square* plan, and, if the bays of the aisles were square it follows that the wider naves consisted of *oblong* bays; that is to say, the arches from side to side, and which were strengthened by *transverse ribs*, were *wider* than the arches from pier to pier, which were strengthened by *wall ribs*.

What was to be done? If they all sprang from the same level, the wee wall arches would only reach part of the way up the transverse arches and would look ridiculous (though this system is adopted in Renaissance buildings, such as our St. Paul's Cathedral, and is there well managed). If the transverse arches were bodily raised above the clearstory the want of abutment would bring the whole church to grief. At Autun Cathedral they reduced this danger by adopting a *pointed* tunnel vault over a clearstory, but such churches have either fallen or been subsequently supported by flying buttresses, and still their tunnel vault is dark.

In the nave of Vézelay Abbey church a new departure was made at the beginning of the twelfth century by building a groined vault which rose from the apex of the wall ribs up to the level of the apex of the transverse ribs. This construction, or "domed groining," as it is sometimes called, was also used in the Rhenish churches. An improvement was effected in the porch or narthex of this same church at Vézelay (of which a section is given by Fergusson on p. 655), so far as the appearance of the vault is concerned, but at the sacrifice of clearstory windows again, so that not much had been gained. Viollet-le-Duc next discusses the possibility of getting the crowns of the wall ribs up to the same level as those of the transverse ribs, so that the wooden tie-beam roof may sit comfortably above them without any waste of space, with the result that down goes the springing line of the transverse ribs! That would not do. He says that it was after many hesitations that, towards 1220, the crowns of these two sets of ribs were arranged so as to reach the same level. Now the groins came to be strengthened by *diagonal ribs*. By comprising *two bays* of vaulting and making these diagonal ribs a semicircle, their height agreed pretty comfortably with that of the transverse ribs. True, this arrangement produced six spaces and gave the wall ribs a squint-eyed appearance; but it was followed for many years, and goes by the name of *hexpartite* vaulting.

The height of these great diagonals was felt to be a nuisance, for Viollet-le-Duc insists that the builders of those days *did not* wish to give their naves any loftier proportions than were required for the necessary fitting on of the side aisles; and that, at last, it occurred to them to treat *each bay* of the nave with its own diagonal ribs, of consequently less altitude and forming four spaces or *quadripartite* vaulting. This subject is more clearly explained in the lectures at the Architectural Association by means of a model; but it is also very fully described and illustrated in Scott's Academy Lectures, Nos. 14 and 15, in vol. ii.

Willis's paper on the construction of the vaults of the Middle Ages in vol. iii. of the Loan Collection of the Transactions is a recognised standard work on the subject, and deals with English examples. An excellent means of studying a building, book in hand, is afforded by Scott's "Gleanings from Westminster Abbey," and also by Willis's "Canterbury Cathedral." While Rickman's "Gothic Architecture" is a valuable companion in a visit to any part of our island. Parker's "Glossary," in three vols.; Bloxam's handy little pocket volume, Paley's "Gothic Mouldings," De Caumont's "Abécédaire" (for France), and Smith's "Gothic and Renaissance" (for all countries), are also portable friends in need.

Of larger works on Gothic architecture there s nearly no end. Pugin's "Specimens," his "Examples," Pugin & Britton's "Normandy," Britton's "Cathedrals," Sharpe's "Parallels," Turner's "Domestic Architecture of the Middle Ages," are all most useful; while of monographs on particular buildings, Neale's "St. Albans," Christian's "Skelton," and hosts of others will be found in the Institute Library. Last, but not least, the early volumes of the "Architectural Association Sketch-book" were far more devoted to Gothic work than the recent ones have been. While recognising the fact that there are many beautiful buildings in England that are not Gothic, it must not be forgotten that our Early English, Decorated, and Perpendicular styles are thoroughly national and are more at home in our climate and in the midst of our lovely scenery than Italian work can ever be; and that, in assimilating the juices of the latter we need not loosen our hold on the stem and branches of the former.

## Miscellanea.

**Prizes for Designs for Furniture.**—The Council of the Society of Arts are trustees of the sum of 400*l.*, presented to them by the Owen Jones Memorial Committee, to expend the interest thereof in prizes to "Students of the Schools of Art, who in annual competition produce the best designs for household furniture, carpets, wall-papers and hangings, damasks, chintzes, &c., regulated by the principles laid down by Owen Jones"; the prizes to "consist of a bound copy of Owen Jones's 'Principles of Design,' a bronze medal, and such sums of money as the fund admits of." The prizes will be awarded on the results of the annual competition of the Science and Art Department. Competing designs must be marked "In competition for the Owen Jones Prizes." No candidate who has gained one of the above prizes can again take part in this competition. The next award will be made in 1885, when six prizes are offered for competition, each prize to consist of a bound copy of Owen Jones's "Principles of Design," and the Society's Bronze Medal.

**A New Smoke-consuming Locomotive.** An engine of a novel type has recently been constructed by the Brooks Locomotive Works for the Chicago Locomotive Improvement Company. The head-light is placed where the stack generally is, while the stack is at the rear of the boiler and close to the cab. The boiler is one of the largest manufactured (what is known as a 60-in. shell), and the smoke, gas, &c., traverse it twice, along the bottom and over the back on the top to the stack. This makes such a good combustion that the finer particles of fuel, the gas, and the smoke are almost entirely consumed, and when the engine is going at full speed it is impossible to see any smoke. The smoke stack itself is very small, being not more than 7 in. to 8 in. in diameter. The patentee, Mr. Charles B. Coventry, claims among the advantages of this invention that it gets a steady, even draught, reduces the waste of fuel to a minimum, and throws no cinders, sparks, or fire. The locomotive is peculiar in appearance, but it is said that it does its work well. It weighs 40 tons, which is 10 tons heavier than the largest engine at present on the Dunkirk, Alleghany Valley, and Pittsburgh Railroad.—*Iron*.

**Royal Victoria Hall and Coffee Tavern.** This hall (long known as the Victoria Theatre), will re-open this Saturday, August 30. The programme for the coming season comprises "Variety" entertainments and lectures. In this connection we note that Mr. Malden is engaged to deliver a course of lectures on "Egypt and the Soudan." On each Monday André's Alpine Choir with soloists will appear, and on Wednesdays an assault-at-arms is included in the plan. The managers are evidently striving energetically to provide cheap amusements for the people, and we hope they will succeed in attracting large audiences.

**Eastbourne Fine Art Exhibition.**—We learn that in order to meet the wishes of exhibitors, the committee have decided upon a change of date, and to hold the above exhibition from the 24th of September to the 3rd of October, all exhibits to be sent in on the 22nd of September, 1884.

**Parcel Post Accommodation at St. Martin's-le-Grand.**—The roofs over the yards at the General Post-Office, St. Martin's-le-Grand, mentioned by us a fortnight ago, are glazed on Mr. T. W. Helliwell's patent system.

**A South Kensington Exhibition for 1886.**—The principal Indian Princes and Chiefs have been sent invitations to join the Royal Commission for the Exhibition of India and the Colonies, to be held in 1886. Among them may be named the Nizam, Scindiah, Holkar, the Maharajahs of Mysore, of Bhownuggur, of Cashmere, and of Oodeypore. The Governor General, the Governors of the two Presidencies of Bombay and Madras, the Political Agents, the Secretary of State, and some members of the Indian Council, Mr. Godley, Sir Owen Burne, Sir George Birdwood, Sir Philip Cunliffe Owen, Mr. Pedder, and other gentlemen connected with India have also been invited.

**Enlargement of the London School Board Offices.**—The offices of the London School Board on the Thames Embankment are now undergoing a very considerable enlargement by the erection of a new block of buildings having a frontage to the Embankment of 60 ft., and extending from the present offices to the newly-erected Fitzalan Chambers, which have just been built by the Law Land Company. The elevation of the extension will be uniform with that of the existing building. The accommodation provided by the enlargement will contain (besides numerous general offices) a new committee-room. The building is being erected from the designs of Mr. E. R. Robson, architect to the Board. The contractors are Messrs. Higgs & Hill.

**Tunbridge Wells.**—On Saturday last the Marchioness of Abergavenny laid the foundation-stone of a new convalescent home, which is about to be erected on a site adjoining Hawkenbury Church, near Tunbridge Wells. It was about fourteen years ago that Mrs. Thomas Ladds first established a similar institution on a small scale at Frant Forest. The new building, which will be of the Domestic Gothic style of architecture, will cost about 1,900*l.* It will be of red brick, and the walls will be hollow throughout. There will be accommodation for twenty-eight beds. The architect is Mr. J. Ladds, of Chapel-street, Bedford-row, London, and the builders are Messrs. Beale & Son, Frant-road, Tunbridge Wells.

**New Gas Tubing.**—We have received from Mr. Fletcher, of Warrington, a specimen of his new elastic rubber tubing, which is stated to be perfectly gas-tight and free from smell. The tubing is made of two layers of rubber, with pure soft tinfoil vulcanised between. This tube is "the result of many years' experiments." Irrespective of the well-known fact that extremely thin layers of rolled or beaten metal are perfectly gas-tight, the tube has been in practical use for some time, and has been thoroughly tested for months under continuous and heavy pressures of gas.

**Errata.**—By two vexatious errors which occurred in our last, the signatures of two of our correspondents were incorrectly given. The printer had been directed to substitute "R." for the "H." incorrectly printed as the initial letter in Mr. Herbert Carpenter's signature, so as to make it read correctly as "R. Herbert Carpenter," but in "correcting," the "R." was somehow substituted for the "E." which was the first initial of the writer of the letter about the curious floor at Croydon, whose signature should have been printed as "E. G. Carpenter."

**Gilchrist Engineering Scholarships.**—These scholarships, in connexion with University College, London, are given by the Gilchrist Trustees. They consist of an entrance scholarship, value 35*l.* per annum, tenable for two years, and a senior scholarship, value 80*l.* (half payable at the time of the award and half in the succeeding June), to be awarded at the close of each session. The examination for the entrance scholarship will be held this year on the 25th September and following days.

**Scandinavian Antiquities.**—Dr. Phené, F.S.A., has been for some time investigating the museums and private collections of antiquities in Scandinavia, and also the Ship Mounds of Norway, and the stone monuments of Denmark and Sweden, in continuation of his researches in Iceland and the Northern American Continent.

**The New Council Chamber at Guildhall.** The opening of the new Council Chamber at Guildhall will (according to the *City Press*) take place about the 25th of September. The building has cost about 40,000*l.* We gave a large view of the interior nearly a year ago.

**Disinfection and Deodorisation.** — We have received certain papers from Messrs. Fearenside & Baynes as to a patent automatic disinfecting and deodorising apparatus, which can be used in connexion with water-closets, urinals, water-carts, &c., and which is so designed that any given quantity of a disinfecting fluid can be mingled with the water and be automatically delivered whenever either of the appliances referred to comes into use. Mechanically the arrangement is ingenious, and wherever the regular mingling of a fluid disinfectant with any water becomes necessary it will be useful. But our doubt as to the value of this and allied appliances is twofold. If a water-closet, for example, be foul, its filth will certainly not be "disinfected" by means of such an arrangement. Disinfection must be regarded as meaning the destruction of matter capable of conveying infection, and in the present state of our knowledge as to what constitutes the poison of the infectious fevers we cannot speak of disinfection apart from the destruction of all the organic matter in which the infection may lie hidden, and it is certain that no occasional flushing with water containing a certain quantity of any of the ordinary so-called "disinfectants" attains this end. Then, again, if a water-closet does really stand in need of such occasional chemical flushings, it may be taken for granted that the apparatus is in fault, being one permitting the retention of contents or being otherwise favourable to foulness. The remedy is to get rid of the faulty contrivance, not to attempt to deal with it by disinfecting fluids. In so far as the apparatus facilitates deodorisation it may have important uses, especially in connexion with urinals and street watering, but even then we should prefer to see the removal of the conditions which lead to offensiveness, rather than the attempt, however successful, to deal with them by an ingenious method of deodorisation.—*Lancet.*

**A New Patent Safety Cage for Collieries.** At a meeting of the Bolton and District Colliery Managers' Association, held on Monday, Mr. J. Lindley, of the Clifton and Kearsley collieries, exhibited his model clip cage to prevent accidents arising from overcrowding or the breaking of the winding rope. In case of overcrowding, the orifice through which the rope passes presses together the loose iron jaws from which the cage is suspended, releasing the central pin, which slips out of the jaws, and the cage remains suspended instead of being dashed through the head gear. The apparatus to prevent the cage falling down the shaft through breakage of the rope, consists in connecting the lower ends of the top rods to a pair of levers mounted on each side of the cage, the other end of the levers being forked and connected to opposite ends of a pair of links, which are fastened to the ordinary wooden or iron guide rods. As soon as the cage is released from the rope the inner arms of the levers rise and force the links together. The inner side of the forks being provided with wedge projections, which come in contact with similar projections on the sides of the links, the cage remains suspended, wedged fast to the guide rods. The meeting approved the principle of the cage.

**Accidents in Summer.**—The remark is often made that accidents in the summer time rarely occur; in the short days of winter, darkened by fogs, and the roads made dangerous by frosts and floods, accidents are looked for as a matter of course. The growing taste for athletic pursuits, and the increasing risk to those who engage in them, have, however, brought the two seasons more into unison as regards liability to accidents, and no more striking evidence of the truth of this statement can be found than the statistics of the Railway Passengers Assurance Company. In the week ending the 12th of August, notice of injury to 210 insurers was received, and no fewer than five fatal cases were reported; the injuries were caused by accidents at lawn tennis and cricket, when bathing, boating, riding, and driving, bicycle and tricycle riding, &c.

**Health Exhibition Library.**—The catalogue of the Health Exhibition Library, which has just been brought out, but is to be regarded as still "under revision," owing to the influx of new publications, presents a long array of titles of books relating to hygiene, forming a collection which visitors to the exhibition are to have the opportunity of consulting, and two rooms in the Albert Hall have been set apart as a library and reading-room. The collection consists entirely of voluntary contributions.

**Roman Remains in London.**—Mr. Roach Smith, in a letter to the *Times*, says:—The destruction of the remains of London Wall has brought to light some unexpected and important evidence of the fortunes of Londinium which do not yet seem to have been adequately attended to. Many years since I noticed that the foundations of the Roman wall on the river side were largely constructed of materials which had previously been used in public buildings, and near Tower-hill some fine sepulchral monuments have been made to serve in the same inglorious capacity. More recently, during the further demolition of the wall, it has been ascertained that it was in part constructed with the materials of anterior buildings to an unsuspected extent, some of the bastions being largely composed of them; and now, in the curtain wall near Castle-street, in Bevis Marks, additional sculptured stones with fragmentary inscriptions are being disinterred, luckily under the supervision of a few active members of the London and Middlesex Archæological Society. They will make a valuable addition to those in the Guildhall Museum. These remains confirm the opinion I published many years ago on the comparatively late date of the circumvallation of Londinium known to us as London-wall.

**The New Sewerage Scheme for Sheffield.** At a meeting of the Sewerage and Rivers Committee, Mr. Wm. Todd, of Sheffield, was appointed clerk of the works in connexion with the sewerage scheme. There were 108 applications.

**The Iron and Steel Institute.** — The autumn meeting of this Institute is to take place in the city of Chester, on September 23rd and three following days.

## COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

*Epitome of Advertisements in this Number.*

### COMPETITIONS.

| Nature of Work. | By whom required. | Premium. | Designs to be delivered. | Page. |
|---|---|---|---|---|
| Municipal Hall and Offices, Bombay | Municipal Commissnrs. | Rs. 5,000, 3,000, 2,000... | Nov. 6th | ii. |
| School Buildings | Governors of Longton Endowed School ... | Not stated | Not stated ... | ii. |

### CONTRACTS.

| Nature of Work, or Materials. | By whom required. | Architect, Surveyor, or Engineer. | Tenders to be delivered. | Page. |
|---|---|---|---|---|
| Making Roads | Wandsworth B. of Wks. | *Official* | Sept. 2nd | xxii. |
| Connecting House-Drainage with the Sewers | Brentford Local Board | do. | do. | ii. |
| Sewerage Works, &c. | Westminster B. of Wks. | do. | Sept. 3rd | xxii. |
| Painting, &c., Union Workhouse, Bromley ... | Grdns of Stepney Un. | Messrs. Harston | Sept. 4th | ii. |
| Pipe-Sewer and Road, Penge | Not stated | W. Adams Murphy | do. | ii. |
| Schools, and Master's Residence | Stanwix School Board | C. J. Ferguson | Sept. 5th | xxii. |
| St. Andrew's Church, Birchills, Walsall | | J. E. K. Cutts | do. | xxii. |
| Piling, &c. | Teddington Local Brd. | *Official* | Sept. 8th | ii. |
| Extension of Passenger Station at Halifax | Lan. & Yorks. Ry. Co. | do. | do. | xxii. |
| New Station at Bradford | do. | do. | Sept. 9th | xxii. |
| Broken Guernsey Granite | East Ham Local Board | do. | do. | ii. |
| Reservoir, &c. | Stratford-on-Avon T. C. | Ed. Pritchard | do. | xxii. |
| Shops and Offices, Market-place | Leicester Corporation | F. E. Lidiard James ... | Sept. 11th | xxii. |
| Granite | Twickenham Local Brd. | *Official* | do. | xxii. |
| Asphalte Carriageway Pavements | Commissionrs of Sewers | do. | Sept. 12th | ii. |
| Sewerage Works at Presteigne | Knighton Un. R. S. A. | Chas. Slagg | Sept. 15th | xxii. |
| Brick and Pipe-Sewers, &c. | Willesden Local Board | *Official* | Sept. 16th | xxii. |
| Post-office at Stroud | Com. of H.M. Works... | do. | Sept. 20th | ii. |
| Police-court and Offices at Stratford | West Ham Local Brd. | do. | Sept. 23rd | xxii. |
| Cooking Apparatus, Kitchen and Bakery Fittings, &c. | Corporation of Exeter | R. Stark Wilkinson | Sept. 25th | xxii. |
| Brick Sewer at Grove Park, Lee | Met. Board of Works | *Official* | do. | ii. |
| Enlargement of Station, Perth | Perth Gen. Statn. Com. | Blyth & Cunningham... | Sept. 26th | ii. |
| New Offices, Berwick-street, Newcastle | Tyne Improvment Com. | R. J. Johnson | Sept. 30th | ii. |
| Re-building of superstructure & strengthening of Hammersmith Bridge | Met. Board of Works | *Official* | October 2nd | ii. |
| Portland Cement | Improvemnt Commisnrs Port of Calcutta | | October 8th | ii. |
| Gas Brackets, &c. | Leeds Corporation | *Official* | Not stated | ii. |
| Excavation, foundations, &c. | National Liberal Club | A. Waterhouse | do. | ii. |

### PUBLIC APPOINTMENTS.

| Nature of Appointment. | By whom Advertised. | Applications to be in. | Salary. | Page. |
|---|---|---|---|---|
| Assistant to Surveyor's Office of Works | Civil Service Com. | Sept. 5th | Not stated | xviii. |

## TENDERS.

For new station, Upper-street, Islington, for the London Salvage Corps. Mr. Wimble, architect:—

| | |
|---|---|
| Dove Bros. | £13,675 0 0 |
| Scrivener & Co. | 13,615 0 0 |
| Grover | 13,384 0 0 |
| Bird | 13,289 0 0 |
| Greenwood | 12,993 0 0 |
| Lawrance & Sons | 12,771 0 0 |
| Morter | 12,737 0 0 |

For pulling down and rebuilding Nos. 1, 3, 5, and 7, Great Portland-street, Nos. 37 and 38, Great Castle-street, and premises in rear of Oxford-street, for Mr. Peter Robinson. Mr. A. E. Hughes, architect. Quantities by Messrs. Corderoy & Sandell:—

| | |
|---|---|
| Higgs & Hill (accepted) | £37,740 0 0 |

[Full list published by us a fortnight ago.]

For rebuilding No. 321, Strand, W.C. Mr. T. E. Knightley, architect. Quantities by Messrs. Batterbury & Huxley:—

| | |
|---|---|
| Kiddle & Sons | £3,900 0 0 |
| J. & J. Greenwood | 3,739 0 0 |
| C. Wall | 3,666 0 0 |
| Wm. Brass | 3,467 0 0 |
| Patman & Fotheringham | 3,385 0 0 |
| Ashby Bros. | 3,245 0 0 |

For the erection of a Bible Christian Chapel, Shanklin, Isle of Wight. Mr. James Newman, architect:—

| | |
|---|---|
| James Huyden | £1,932 0 0 |
| John White | 1,927 0 0 |
| George Hayles | 1,868 0 0 |
| Isaac Benton | 1,760 0 0 |
| James Ball (accepted) | 1,695 0 0 |
| A. Newnham | 1,490 0 0 |

For the erection of studio, Golder's-hill, Hampstead, for Sir T. Spencer Wells, bart. Mr. Arthur Vernon, architect, 26, Great George-street, Westminster, and High Wycombe:—

| | |
|---|---|
| Bird (accepted) | £316 0 0 |

For new sugar-boiling and confectionery works at Lincoln, for Messrs. Poppleton & Son. Mr. James Whitton, architect. Quantities supplied:—

| | |
|---|---|
| Harrison & Sands | £2,847 0 0 |
| Kendall | 2,799 15 0 |
| Simpson & Goy | 2,756 0 0 |
| Horton | 2,746 0 0 |
| Morgan | 2,693 11 0 |
| Martin & Sims | 2,649 0 0 |
| Baines | 2,648 10 0 |
| H. S. & W. Close | 2,645 0 0 |
| Middleton | 2,607 19 0 |
| Knight | 2,600 0 0 |
| Bradley & Noble | 2,596 0 0 |
| Wright | 2,589 0 0 |
| Crosby & Sons (accepted) | 2,495 0 0 |
| J. M. Harrison | 2,487 0 0 |
| J. B. Harrison | 2,484 0 0 |
| J. & H. Woolhouse | 2,380 0 0 |
| Codd & Esberger | 2,165 0 0 |

For completing five houses, Gascony-avenue, Kilburn, for Mr. Geo. Gladman. Mr. Chas. J. Gladman, architect:—

| | |
|---|---|
| Falkner | £1,275 0 0 |
| Pryor | 1,175 0 0 |
| Barnett | 1,050 0 0 |
| Barnes (too late) | 1,232 2 9 |

For alterations and additions to No. 173, High-street, Brentford, for Mr. Geo. Stone. Mr. Chas. J. Gladman, architect:—

| | |
|---|---|
| Gibson | £384 10 0 |
| Nye | 265 0 0 |
| Dovey | 258 18 10 |
| Barnes | 244 3 10 |

For alterations and repairs to No. 34, Baker-street, for Mr. Arthur Canton. Mr. Chas. J. Gladman, architect:—

| | |
|---|---|
| D. D. & A. Brown | £417 0 0 |
| J. Brown | 375 13 0 |
| Langridge & Sons | 300 0 0 |
| J. Styles & Son | 295 0 0 |
| Falkner | 257 0 0 |

For the erection of a 4½-quarter brewery, at Vauxhall, for Barrett's Screw Stopper Bottling Co., Limited. Messrs. H. Stopes & Co., architects, 24a, Southwark-street, S.E. Quantities by Mr. F. E. Morris, Colchester:—

*Main Building only.*

| | | | |
|---|---|---|---|
| Babbs Bros. | £8,230 | 0 | 0 ! |
| Thos. Hooper | 7,005 | 5 | 3 |
| R. & E. Evans | 6,598 | 0 | 0 |
| Balaam Bros. | 6,000 | 0 | 0 |
| Thos. Watson | 5,896 | 0 | 0 |
| J. Rider Hunt | 5,656 | 0 | 0 |
| Chas. Oldridge & Sons | 5,650 | 0 | 0 |
| W. W. Lorden & Sons | 5,649 | 0 | 0 |
| Ben Cook | 5,590 | 0 | 0 |
| Chas. Manning | 5,545 | 0 | 0 |
| G. Howard | 5,528 | 18 | 0 |
| O. T. Gibbons | 5,450 | 0 | 0 |
| R. W. Priestley | 5,437 | 0 | 0 |
| Jones Bros. | 5,402 | 0 | 0 |
| Chas Blyton | 5,400 | 0 | 0 |
| Edwin Stafford | 5,358 | 0 | 0 |
| Scharien & Williams | 5,278 | 0 | 0 |
| C. Ansell | 5,225 | 0 | 0 |
| W. F. Croaker | 5,195 | 0 | 0 |
| E. C. Howell & Sons | 5,190 | 0 | 0 |
| D. D. & A. Brown | 5,120 | 0 | 0 |
| F. Higgs | 5,080 | 0 | 0 |
| J. Allen & Sons | 4,980 | 0 | 0 |
| G. Stephenson | 4,978 | 0 | 0 |
| J. Tyerman | 4,883 | 0 | 0 |
| J. Dickeson | 4,816 | 0 | 0 |
| Stephens & Bastow | 4,733 | 0 | 0 |
| Chas. Dickinson (accepted) | 4,480 | 0 | 0 ! |

For alterations and additions to Lucton Foundation Schools, near Kingsland, Herefordshire. Mr. F. R. Kempson, architect, Hereford. Quantities by Mr. F. Downing:—

| | School. £. | Sanatorium. £. | s. |
|---|---|---|---|
| Jones & Sons, Sedgley, near Dudley | 12,000 | 1,900 | 0 |
| Benj. Weale, Ludlow | 11,526 | 1,821 | 0 |
| D. D. & A. Brown, London, S.E. | 11,487 | 1,705 | 0 |
| Huckson & Warwick, Hereford | 11,450 | 1,780 | 0 |
| Bowers & Co., Hereford | 11,390 | 1,700 | 0 |
| Richard Yates, Shifnal | 11,159 | 1,695 | 0 |
| John Wood & Co., Westminster | 11,141 | 1,489 | 0 |
| Henry Welsh, Hereford | 11,000 | 1,700 | 0 |
| William Cullis, Hereford | 11,000 | 1,700 | 0 |
| Horsman & Co., Wolverhampton | 10,997 | 1,595 | 0 |
| Thos. Collins, Tewkesbury | 10,990 | 1,560 | 0 |
| Chas. Claridge, Banbury | 10,568 | 1,495 | 0 |
| Edwards & Grosvenor, Leominster and Ludlow | 10,400 | 1,480 | 0 |
| Treasure & Son, Shrewsbury | 10,137 | 1,477 | 7 |
| Page & Son, Leominster | — | 1 418 | 10 |

For branch stores and dwelling-houses for the Denton and Haughton Co-operative Society, Limited, Denton, near Manchester. Mr. T. Cook, architect, Victoria-buildings, Manchester. Quantities by the architect:—

| | | | |
|---|---|---|---|
| Sandam & Thomson, Fairfield | £3 255 | 10 | 0 |
| Turner, Knutsford | 2,900 | 0 | 0 |
| Rome, Manchester | 2,727 | 0 | 0 |
| Macfarlane & Co., Manchester | 2,599 | 0 | 0 |
| Butter & Carson, Manchester | 2,580 | 0 | 0 |
| Haughton, Godley | 2,550 | 0 | 0 |
| Robinson & Parkes, Hyde | 2,527 | 0 | 0 |
| W. Brown, Salford * | 2,435 | 0 | 0 |
| Warrington, Newton Moor | 2,407 | 10 | 0 |
| Holland, Pendleton | 2,425 | 0 | 0 |
| Williams, Manchester* | 2,397 | 0 | 0 |
| Whittell, Manchester* | 2,351 | 0 | 0 |
| Burgess & Gault, Manchester | 2,350 | 0 | 0 |
| Haynes, Hulme | 2,325 | 0 | 0 |
| Shaw Cuzner, Stalybridge | 2,312 | 0 | 0 |
| Aughton, Dukinfield | 2,300 | 0 | 0 |
| Clayton, Denton (accepted) | 2,300 | 0 | 0 |
| Robinson, Hyde | 2,290 | 0 | 0 |
| Stover, Denton | 2,290 | 0 | 0 |

* Too late.

For erection of additional schoolrooms and infant mistress's residence, at the Quarry-hill Board Schools, for the Gray's Thurrock School Board. Mr. E. Clerk Allam, architect, Romford. Quantities supplied:—

| | | | |
|---|---|---|---|
| E. Stafford, Old Kent-road | £6,298 | 0 | 0 ! |
| G. D. Seager, Gravesend | 4,570 | 0 | 0 |
| Thompson & Tweed, Burdett-road | 3,279 | 0 | 0 |
| Wm. Wood, Chelmsford | 3,184 | 0 | 0 |
| G. Mower, Hackney | 3,035 | 0 | 0 |
| Jas. Webb, Stratford | 2,925 | 0 | 0 |
| S. W. Hawkins, London | 2,741 | 0 | 0 |
| Aldridge & Jenvey, Camberwell | 2,683 | 0 | 0 |
| H. J. Carter, Grays (accepted) | 2,635 | 0 | 0 ! |

For the erection of a shop and bakehouse at William-street, Grays, for Mr. J. R. Banks. Mr. E. Clerk Allam, architect:—

| | | | |
|---|---|---|---|
| J. Brown, Grays (accepted) | £868 | 0 | 0 |

For rebuilding premises at the corner of Long Acre and Mercer-street, for Mr. Fredk. Kingwell. Mr. Albert E. Kingwell, architect, Victor House, Theobald's-road. Quantities supplied:—

| | | | |
|---|---|---|---|
| G. Kirk | £2,549 | 0 | 0 |
| W. & H. Salmon | 2,497 | 0 | 0 |
| Lawrance & Son | 2,350 | 0 | 0 |
| Pickersgill Bros. | 3,300 | 0 | 0 |
| Martin Wells & Co. | 2,280 | 0 | 0 |
| Kirk & Randall | 2,180 | 0 | 0 |
| Green (accepted) | 1,835 | 0 | 0 |

For painting, &c., at the Workhouse and Infirmary, for the Guardians of the Parish of St. Leonard, Shoreditch. Messrs. Lee & Smith, architects. Quantities by Mr. Walter Barnett:—

| | | | |
|---|---|---|---|
| Coombe | £675 | 0 | 0 ! |
| Shurmur | 675 | 0 | 0 |
| Green | 653 | 0 | 0 |
| Maskall | 572 | 0 | 0 |
| Barton | 550 | 0 | 0 |
| Gibbin | 533 | 0 | 0 |
| Flaxman | 512 | 0 | 0 |
| Hayworth | 465 | 0 | 0 |
| Wythe (accepted) | 442 | 0 | 0 |
| Harper | 437 | 10 | 0 |
| Ware | 400 | 0 | 0 |
| Deacon | 298 | 0 | 0 |
| Lawson | 275 | 0 | 0 ! |

For constructing 1,276 ft. lineal of 50 ft. road and 153 ft. lineal of 40 ft. road, kerbed with 12 in. by 6 in. granite kerb, and the requisite water-drainage, on the Surbiton Estate, No. 2, of the National Liberal Land Company, Limited. Mr. Geo. Pooley, surveyor, 26, Charing-cross, London, S.W.:—

| | | | |
|---|---|---|---|
| William Carter, Anerley | £1,155 | 0 | 0 |
| John Stickley, Surbiton | 1,050 | 0 | 0 |
| Samuel Chafen, Rotherhithe | 947 | 0 | 0 |
| James Bloomfield, Tottenham | 925 | 0 | 0 |
| William Nicholls, Wood-green* | 895 | 0 | 0 |

* Accepted.

For the erection of three houses at Dorking, for Mr. G. Whitford. Mr. F. C. Dyer, architect, 93, Gracechurch-street, E.C.:—

| | | | |
|---|---|---|---|
| D. Dubbin (accepted) | £920 | 0 | 0 |

For Kettering Sewerage Works. Mr. R. W. Johnson, surveyor and engineer, Kettering:—

*Contract No. 1.—General Works.*

| | | | |
|---|---|---|---|
| Cooke & Co., Battersea | £5,590 | 0 | 0 |
| Corrie & Co., Lichfield | 5,327 | 0 | 0 |
| E. Barton, Rothwell | 5,273 | 0 | 0 |
| Sanders, Northampton | 4,748 | 0 | 0 |
| Dickson, St. Albans | 4,800 | 0 | 0 |
| C. & F. Henson, Kettering | 4,850 | 0 | 0 |
| F. Barton, Kettering | 4,168 | 10 | 0 |
| Geo. V. Henson, Kettering* | 4,100 | 0 | 0 |

*Contract No. 2.—Ironwork.*

| | | | |
|---|---|---|---|
| Wright Bros., Leicester | 724 | 6 | 0 |
| Cave, Northampton | 495 | 0 | 0 |
| Mobbs, Northampton | 492 | 10 | 0 |
| Cort & Paul, Leicester | 473 | 0 | 0 |
| Salmon, Kettering | 450 | 0 | 0 |
| Studd & Co., Kettering | 444 | 6 | 0 |
| Gimson & Co., Leicester* | 396 | 15 | 0 |

* Accepted.

For making new road, to be called Franche Court-road, leading out of Burntwood-lane, Wandsworth, and sewer, for Mr. John Mossop. Mr. Richard M. Hiscocks, architect and surveyor, Wandsworth:—

| | | | |
|---|---|---|---|
| G. & R. Neal | £248 | 0 | 0 |
| Jas. Neal | 220 | 0 | 0 |
| J. Nobbs | 210 | 0 | 0 |
| G. Butler | 185 | 0 | 0 |
| W. Hampton (accepted) | 174 | 0 | 0 |

For making a new road and sewer, leading out of Garratt-lane, Wandsworth, for Mrs. Diana Keatch, of Garratt. Mr. Richard M. Hiscocks, architect and surveyor, Wandsworth:—

| | | | |
|---|---|---|---|
| G. & R. Neal | £174 | 0 | 0 |
| J. Nobbs | 135 | 0 | 0 |
| Jas. Neal | 124 | 0 | 0 |
| G. Butler | 114 | 0 | 0 |
| W. Hampton (accepted) | 112 | 0 | 0 |

For the erection of a portion of premises in Baldwin and Queen Charlotte streets, Bristol, for Messrs. C. T. Jefferies & Sons. Mr. Frank Wells, architect:—

| | | | |
|---|---|---|---|
| Brock & Bruce | £4,353 | 0 | 0 |
| A. J. Beaven | 4,290 | 0 | 0 |
| A. Krauss | 4,250 | 0 | 0 |
| H. A. Forse | 4,180 | 0 | 0 |
| J. Wilkins | 4,130 | 0 | 0 |
| W. Church | 4,079 | 0 | 0 |
| C. Clark, Fishponds | 4,033 | 0 | 0 |
| G. Humphreys | 3,928 | 0 | 0 |
| R. J. Crocker | 3,957 | 0 | 0 |
| Stephens & Bastow | 3,949 | 0 | 0 |
| J. E. Davis | 3,943 | 0 | 0 |
| Eastabrook & Sons | 3,930 | 0 | 0 |
| E. & T. Hatherly | 3,857 | 0 | 0 |
| W. Cowlin & Son (accepted) | 3,821 | 0 | 0 |

For the enlargement and decoration of Lewinsdale House, Weston-super-Mare, for the Rev. Wm. Wheeler Aldridge. Messrs. E. H. Lingen-Barker & Fredk. T. H. Chambers, architects:—

| | | | |
|---|---|---|---|
| Theophilus Palmer (accepted) | £452 | 11 | 10 |

For new stables, &c., to Lewinsdale House, Weston-super-Mare, for the Rev. Wheeler Aldridge. Messrs. E. H. Lingen-Barker & Fredk. T. H. Chambers, architects:—

| | | | |
|---|---|---|---|
| John Palmer | £753 | 0 | 0 |
| Theophilus Palmer | 667 | 0 | 0 |
| Edwin Bryant | 550 | 0 | 0 |
| Thomas Lye | 495 | 0 | 0 |
| Underhay & Pine | 459 | 0 | 0 |
| Charles Addicott (accepted) | 445 | 0 | 0 |

Accepted for altering and rebuilding The Bridge of Hope Mission-rooms, St. George's-in-the-East. Mr. E. M. Whittaker, architect:—

| | | | |
|---|---|---|---|
| The Building, Fitting, and Furnishing Company, Limited (formerly Thos. Hogben & Co.) | £945 | 0 | 0 |

Accepted for shop-fittings to Nos. 128 and 129, Cheapside, for Mr. G. Fischer:—

| | | | |
|---|---|---|---|
| The Building, Fitting, and Furnishing Company, Limited | £411 | 0 | 0 |

Accepted for office fittings to the Equitable Fire Insurance Office, No. 69, Lombard-street:—

| | | | |
|---|---|---|---|
| The Building, Fitting, and Furnishing Company, Limited | £222 | 10 | 0 |

Accepted for shop-front and fittings, for Mrs. Swindley, No. 21, Church-street, Kensington:—

| | | | |
|---|---|---|---|
| The Building, Fitting, and Furnishing Company, Limited | £218 | 0 | 0 |

*The "Falcon," Clapham.*—In our last (p. 279) we gave a list of tenders for alterations at the Falcon public-house, Bedford-road, Clapham. We are asked to say that the accepted tender was that of Mr. Benjamin Cook, of Farringdon-street, and not "Cook Bros."

*Cottages, Shacklewell Estate.*—The name of the successful competitor for this work, and for that mentioned immediately following it in our last (p. 280), should have been printed "Dales," *not* "Dale." Correspondents should be more careful in writing names. We this week have to exclude a list of tenders altogether on account of illegibility.

*Special Notice.*—Lists of tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, Strand, W.C., not later than four p.m. on Thursdays.

## TO CORRESPONDENTS.

C. C. H.—Major K.—R. S. F. (photograph received).—A. W. (proof shall be sent).—A. J. (photographs received).—W. H. T. (drawing received).—L. & L.—J. J. H.—L. H.—W. P. B. (next week).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

*We cannot undertake to return rejected communications.*

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.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